ANNOTATED LIST OF SPECIES

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Ichthyofaunal diversity of the Omo-Turkana basin, East Africa, with specific reference to fish diversity within the limits of Ethiopian waters

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Abstract: The freshwaters of the East African nation of Ethiopia are divided into nine main drainage basins. One of these, the Omo-Turkana basin, spans a large part of southwestern Ethiopian highlands and northern Kenya, and consists of the Omo-Gibe (or simply, Omo) River and a northern portion of Lake Turkana. Despite some development activities, including proposed dam construction with potential impacts on ichthyofaunal diversity, the Ethiopian part of the basin generally lacks comprehensive study or full scientific documentation. During the current surveys 31 species were identified from the lower Omo River and Ethiopian part of Lake Turkana, with some new records for the basin. The Omo River system was found to be richer in species while Lake Turkana has a higher abundance. Ichthyofaunal diversity within Ethiopian waters is specifically addressed, and an annotated checklist for native species of the basin is provided.

Key words: annotated checklist; Lake Turkana; Omo-Gibe River; freshwater fishes; new records; scientific documentation

INTRODUCTION

Ethiopia's inland waters (lakes, rivers and streams) are in nine main drainage basins situated within major physio-geographic units. One of these, the Omo-Turkana basin, spans a large part of the southwestern Ethiopian highlands and northern Kenya (Feibel 2011; Velpuri et al. 2012) (Figure 1).

Historical overview

The basin was first explored for its ichthyofaunal diversity in the second half of the 19th century during Dr. Donald Smith's Lake Turkana expedition (1894–1895). Eight species, with one new description, were identified from the Smith Lake Turkana collection (Günther 1896). In the early 20th century, five species were identified from the Omo River collections of R. Neumann and C. von Erlanger (Boulenger 1903a). A few years later, 14 species from the middle to upper Omo River, and five species from northeastern Lake Turkana were identified from the collections of W. N. McMillan and Zaphiro (Boulenger 1906). At the same time, Pellegrin (1905) identified four species from Lake Turkana in the collections of Maurice de Rothschild from 1904–1905. The first organized expedition to the Omo-Turkana basin was undertaken by Cambridge University in 1930–31 (Worthington 1931, 1932; Worthington & Richardo 1936) as part of its East African Great Lakes expedition. This was followed by a French multidisciplinary scientific expedition to the lower Omo River valley (La mission scientifique de l'Omo, 1932–1933). Pellegrin (1935) identified 15 species referable to

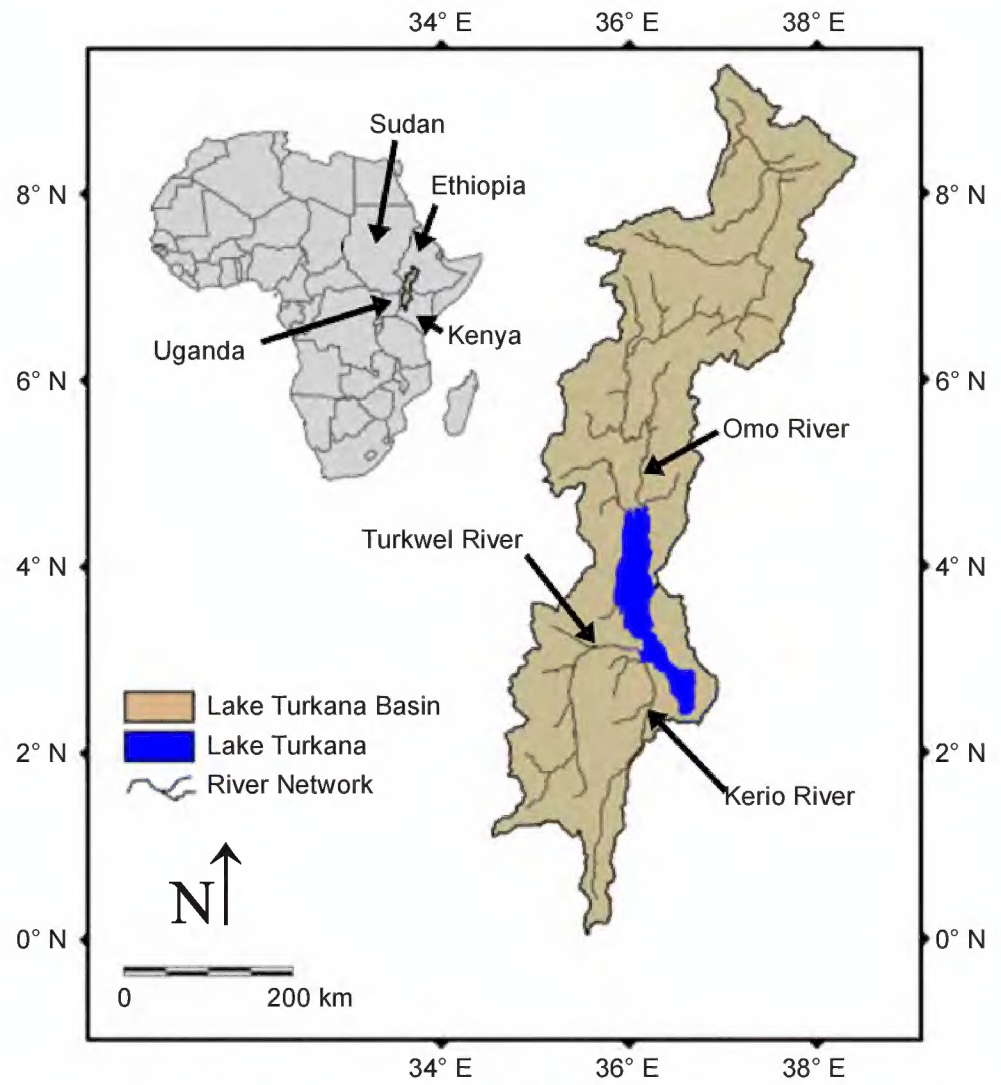

Figure 1. Map of the spatial extent of Omo-Turkana Basin (Source: Velpuri et al. 2012).

13 genera and seven families from that expedition's fish collections, of which two species, *Aplocheilichthys jeanneli* and *Barbus arambourgi* (now *Enteromius arambourgi*), and one subspecies, *Brycinus nurse nana*, were described. Of these 15 species, 12 species were identified from the Omo River (Delta) while three species were from Lake Turkana. The East African Freshwater Fisheries Research Organization (EAFFRO), based in Uganda, also visited Lake Turkana and identified ten species (Hamblyn 1962). A review by Tedla (1973) listed 23 species for the Omo-Turkana system, the majority of which were from the Omo River system. The British Overseas Development Administration's Lake Turkana Project (1972–1975) laid the foundation for much contemporary knowledge of Lake Turkana's ichthyofaunal diversity (Hopson 1982). That comprehensive study also generated information on the lake's limnology and fisheries. The project report, combining original data and review of past work, listed 48 species for the lake with the descriptions of three new ones (Hopson & Hopson 1982). A subsequent Norwegian project (1985–1988), focused mainly on the lake's fisheries (Kolding 1989) and limnology (Källqvist et al. 1988). The Joint Ethio-Russian Biological Expedition (JERBE) listed 53 species in the Omo River basin and 72 species in the entire Omo-Turkana system (Baron et al. 1997). A combination of these preceding studies and other reviews (Roberts 1975; Kolding 1989; Lévêque et al. 1991) results in 74 valid species for the entire Omo-Turkana system. Golubtsov & Darkov (2008) later increased the number of species for the Omo-Turkana system to 76–79, with some pending taxonomic and identification uncertainities of a few species.

Diversity measurements

Global biological diversity is measured at various scales. Alpha diversity measures species richness at a single locality or in a community, whereas beta diversity is a measure of the amount of turnover or heterogeneity in species composition along environmental gradients between localities or communities (Whittaker 1972). Alpha diversity can be used to reflect how finely species are dividing ecological resources, whereas beta diversity can reflect the extent of habitat selection or specialization (Jost et al. 2011). Measures of taxonomic composition and variation as one or more of the components of global diversity have important applications in setting conservation priorities or evaluating regional conservation plans. In ecology, they can also be used to study the homogenizing or diversifying effects of human activities, natural disturbance, or spatial variability of environmental conditions (Olden 2006; Vellend et al. 2007). Studies pertaining to these diversity parameters do not exist for the Omo-Turkana basin except for the scant reports on species occurrences. Moreover, many previous assessments of fish diversity in the basin largely dealt with the main lake in Kenya. Despite some development activities and proposed dams in the Omo basin (Avery 2010) and their potential impacts on biodiversity, the Ethiopian part of the basin generally lacks a comprehensive study or scientific documentation of its ichthyofauna. Such a lack of scientific documentation renders recommendations and/or implementation of appropriate management and conservation measures, as well as future appraisal of impacts, highly problematical. Therefore, the purposes of this study are to:

- Assess alpha and beta diversity indices as well as the species richness of the ichthyofauna of the lower Omo River and Ethiopian part of Lake Turkana,
- Develop a comprehensive ichthyofaunal checklist for the region and an artificial identification key in an effort to document the basin's freshwater fish diversity.

This study forms part of a broader research project on the ichthyofaunal community structure, feeding ecology of dominant fish species, and fisheries socioeconomics of these water bodies. As such, it is hoped that this study will contribute to a comprehensive understanding of the basin's fish fauna as a baseline for its conservation and sustainable fishery.

MATERIALS AND METHODS

Study sites

Fish specimens were obtained from the Ethiopian part of the Omo-Turkana basin (Figure 2). The Omo basin is part of the large Turkana system with a catchment area of 131,000–145,500 km^2 covering southwestern Ethiopia and northern Kenya (Feibel 2011; Velpuri et al. 2012). The Turkana system essentially consists of the Omo-Gibe (or simply, Omo) River and Lake Turkana. However, the basin also encompasses the smaller Turkwell and Kerio River basins on the southwestern shore of the lake in Kenya, and intermittent streams such as the Kalakol and Kataboi on the western Kenyan shore, and the Kibbish on the northwestern shore in Ethiopia (Ferguson & Harbott 1982). In Ethiopia, the basin consists of the Omo River extending north upstream from the shore of the lake to the southwestern Ethiopian highlands, and a portion of Lake Turkana. The Ethiopian part of Lake Turkana is estimated at 1.3% (98 km^2) of the entire lake area (≈ 7560 km^2) (FAO 2003). The Omo River basin makes up 52–58% of the catchment area of the entire Turkana system and supplies 80–90% of the total inflow to the lake (Ferguson & Harbott 1982; Avery, 2010; UNEP 2010). It receives an annual precipitation of up to 2,000 mm (UNEP 2010) although the mean annual rainfall could be as low as 350 mm in the lower Omo River Valley near the lake (EEPCO 2009). The principal stream, the Omo River, has its sources in the southwestern Ethiopian highlands at an elevation of about 2,200 m above sea level (a.s.l.). Its major tributaries, in upstream to downstream order, include Gibe, Gilgel-Gibe, Gojeb, Amara, Alanga, Denchiya, Mui, Zigina-Shoshuma, Mantsa and Usno (with sub-tributaries Mago and Neri). It is 760 km long, traverses Oromia and Southern Nations Nationalities and Peoples (SNNP) regions of Ethiopia, and ultimately flows into Lake Turkana at 365

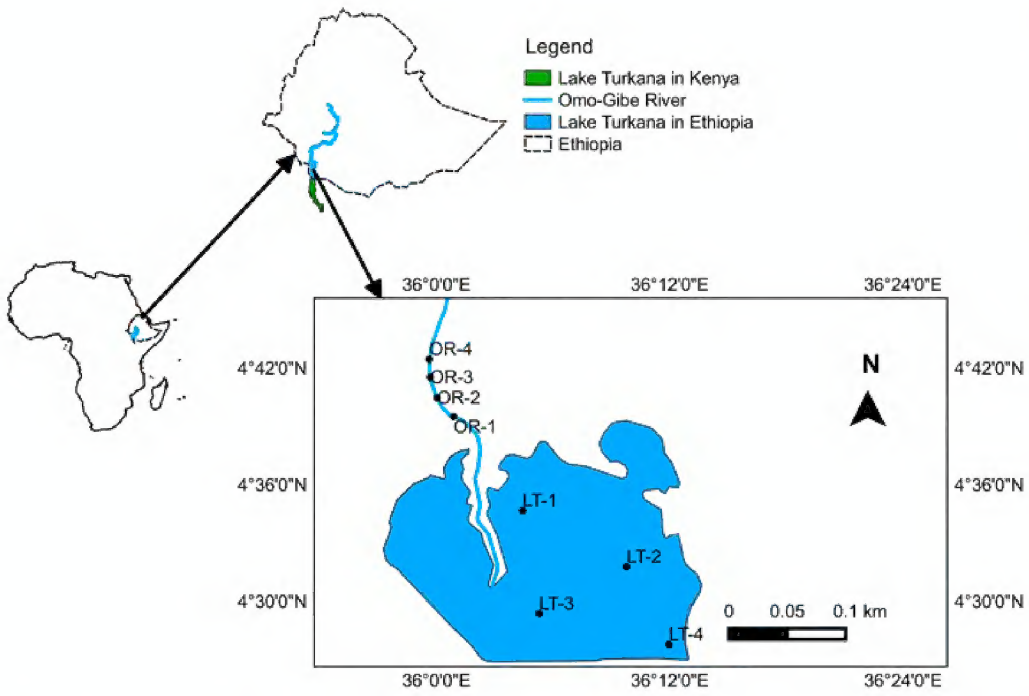

Figure 2. Sampling sites on the lower Omo River (OR1–OR4) and the Ethiopian part of Lake Turkana (LT1–LT4); the reference datum used for geographic coordinates is WGS84.

m a.s.l. (CSA 2009). Biogeographically, the Omo-Turkana basin belongs to the Nilo-Sudanic freshwater ichthyofaunal province (Roberts 1975; Paugy 2010).

Four sampling sites were established at each of two major sampling localities: the lower reaches of the Omo River 50–60 km upstream of its delta, and the Ethiopian part of Lake Turkana (Figure 2). Site selection was based on accessibility and sampling safety. The Omo River sites consisted predominantly of pools with sand or mud substrates whereas the Lake Turkana sites had a largely muddy substrate. Geographic coordinates and related features of the sampling sites are summarized in Table 1.

Data collection

Permissions to sample in the study areas were obtained from local government administrations and fish samples were collected during two dry and two wet seasons between January 2013 and September 2014 (Table 1). Dry season sampling was conducted during periods of the year when there was no rainfall whereas wet season sampling was undertaken immediately following decline of a prolonged rainfall. A combination of monofilament and multifilament gillnets were used for sampling. The gillnets had stretched mesh sizes of 8–44 cm, a panel length of 100 m and a width of 1 m per mesh size. Four sets of gillnets, two parallel and two perpendicular to the shore, were set at a subsurface level at each sampling site. Hook and line, traps, and cast nets supplemented the gillnet sampling especially in inshore areas. Some additional specimens were provided by local artisanal fishers. Fish specimens were fixed in 10% formalin. Identification was made to species level following relevant literature (e.g., Boulenger 1909, 1911, 1915, 1916; Tedla 1973; Hopson & Hopson 1982; Seegers et al. 2003; Habteselassie 2012). Voucher specimens were deposited in the Zoological Natural History Museum (ZNHM) of Addis Ababa University, Ethiopia (Table 2). Unless noted otherwise, the classification of species follows Nelson (2006).

Data analysis

Shannon diversity (H') and evenness (J') indices (Maurer & McGill 2011) were computed as measures of the alpha diversity for the lower Omo River and the Ethiopian part of Lake Turkana using the following formula:

$$H' = -\sum_{i=1}^{S} \mathrm{Pi} \times \ln(\mathrm{Pi});\ J' = H'/\ln(S)$$

Where,
Pi = Proportion of abundance of species *i*
S = Species richness

Rank order abundance plots were generated as the natural logarithm of abundance values versus the abundance rank order for further assessment of evenness. Differences in the parameters of alpha diversity measures between the river and the lake samples were compared using a randomization (permutation) test (Magurran 1988; Solow 1993). Whittaker's beta diversity index (β_w) (Whittaker 1972), a robust index (Wilson & Shmida 1984), was used to assess the rate of species turnover between the lower Omo River and Lake Turkana samples, and is calculated as:

$$\beta_w = \left(\frac{S}{\alpha}\right) - 1$$

Where,
S = total number of species of the habitats
α = average species richness per habitat

An individual-based rarefaction analysis was performed to standardize diversity comparison between the two systems (Magurran 2004; Gotelli & Colwell 2011). All statistical analyses were carried out in PAST version 3.08 (Hammer et al. 2001). Ultimately, data obtained during the

Table 1. Sampling sites and sampling seasons on the lower Omo River (OR1–OR4) and the Ethiopian part of Lake Turkana (LT1–LT4), including altitude above sea level (Alt, meters), water depth (Depth, meters), and geographic coordinates.

					Sampling seasons and dates			
Site	**Alt (m)**	**Depth (m)**	**Latitude N**	**Longitude E**	**Dry1 (Jan. 13)**	**Wet1 (Nov. 13)**	**Dry2 (Apr. 14)**	**Wet2 (Sep. 14)**
OR1	362	6.1	04°39′29.88″	036°00′52.56″	9–10	1–2	1–2	15–16
OR2	372	5.3	04°40′28.20″	036°00′01.44″	11–12	3–4	3–4	17–18
OR3	370	7.5	04°41′31.92″	035°59′40.20″	13–14	5–6	5–6	19–20
OR4	367	4.8	04°42′27.36″	035°59′37.32″	15–16	7–8	7–8	21–22
LT1	359	2.1	04°34′40.08″	036°04′25.32″	17–18	9–10	9–10	23–24
LT2	357	1.7	04°31′46.92″	036°09′46.44″	19–20	11–12	11–12	25–26
LT3	359	2.4	04°29′22.20″	036°05′16.44″	21–22	13–14	13–14	27–28
LT4	357	2.8	04°27′46.80″	036°11′57.12″	23–24	15–16	15–16	29–30

Table 2. List of fish species collected in the lower Omo River (OR1–OR4) and the Ethiopian part of Lake Turkana (LT1–LT4); family-group name for Arapaimidae is according to Laan et al. (2014); "X" stands for species sampled in a particular locality; voucher numbers of the specimens deposited in the Zoological Natural History Museum (ZNHM) of Addis Ababa University are in the last column.

Order/family/species	OR1	OR2	OR3	OR4	LT1	LT2	LT3	LT4	Voucher
POLYPTERIFORMES									
Polypteridae									
Polypterus bichir Lacepède, 1803						X			ZNHM-F-0001
Polypterus senegalus Cuvier, 1829			X						ZNHM-F-0002–3
OSTEOGLOSSIFORMES									
Arapaimidae									
Heterotis niloticus (Cuvier, 1829)							X		ZNHM-F-0004
Mormyridae									
Mormyrus caschive Linnaeus, 1758		X			X				ZNHM-F-0005–6
Mormyrus kannume Forsskål, 1775				X					ZNHM-F-0007
Mormyrops anguilloides (Linnaeus, 1758)			X	X					ZNHM-F-0008–9
Hyperopisus bebe (Lacepède, 1803)			X	X					ZNHM-F-0010–12
Pollimyrus petherici (Boulenger, 1898)		X		X					ZNHM-F-0013–14
CHARACIFORMES									
Alestidae									
Hydrocynus vittatus Castelnau, 1861						X	X		ZNHM-F-0015–18
Hydrocynus forskahlii (Cuvier, 1819)		X			X				ZNHM-F-0019–20
Alestes baremoze (Joannis, 1835)	X				X				ZNHM-F-0021–22
Brycinus nurse (Rüppell, 1832)	X					X			ZNHM-F-0023–24
Citharinidae									
Citharinus citharus intermedius Worthington, 1932	X	X				X		X	ZNHM-F-0025–30
Distichodontidae									
Distichodus nefasch (Bonnaterre, 1788)	X	X						X	ZNHM-F-0031–32
CYPRINIFORMES									
Cyprinidae									
Labeo horie Heckel, 1847			X		X				ZNHM-F-0033–34
Labeo niloticus (Linnaeus, 1758)	X		X				X		ZNHM-F-0035–38
Labeo coubie Rüppell, 1832								X	ZNHM-F-0039
SILURIFORMES									
Auchenoglanididae									
Auchenoglanis biscutatus (Geoffroy St. Hilaire, 1809)		X					X		ZNHM-F-0040–41
Auchenoglanis occidentalis (Valenciennes, 1840)				X	X				ZNHM-F-0042–43
Clariidae									
Clarias gariepinus (Burchell, 1822)		X							ZNHM-F-0044–45
Bagridae									
Bagrus bajad (Forsskål, 1775)	X					X			ZNHM-F-0046–47
Bagrus docmak (Forsskål, 1775)		X			X				ZNHM-F-0048–49
Claroteidae									
Chrysichthys turkana Hardman, 2008			X					X	ZNHM-F-0050–52
Malapteruridae									
Malapterurus minjiriya Sagua, 1987			X						ZNHM-F-0053
Mochokidae									
Synodontis filamentosus Boulenger, 1901				X	X				ZNHM-F-0054–55
Synodontis schall (Bloch & Schneider, 1801)	X	X			X	X		X	ZNHM-F-0056–62
Schilbeidae									
Schilbe mystus (Linnaeus, 1758)		X							ZNHM-F-0063
Schilbe uranoscopus Rüppell, 1832	X				X	X			ZNHM-F-0064–67
PERCIFORMES									
Cichlidae									
Oreochromis niloticus (Linnaeus, 1758)	X						X		ZNHM-F-0068–69
Latidae									
Lates niloticus (Linnaeus, 1758)		X		X	X	X	X		ZNHM-F-0070–76
TETRAODONTIFORMES									
Tetraodontidae									
Tetraodon lineatus Linnaeus, 1758							X		ZNHM-F-0077

present study was combined with a thorough review of past studies to develop an annotated checklist of valid native fish species for the entire Omo-Turkana Basin, and an artificial identification key to the species within the Ethiopian part of the basin is provided.

RESULTS

Species richness

During the present sampling, 4,386 fish specimens (lower Omo River, $n = 823$; Lake Turkana, $n = 3,563$) were collected. Altogether, 31 fish species (26 from river sites and 24 from the lake) in 22 genera, 17 families and seven orders were identified from the collections of both localities (Figures 3 and 4; Table 2).

Three species, *Mormyrus caschive, Labeo coubie*, and *Auchenoglanis biscutatus,* are new records for Lake Turkana, and two species, *Hydrocynus vittatus* and *Schilbe uranoscopus,* are new records for the Omo River. One species, *Synodontis filamentosus,* is a new record for both the Omo River and Lake Turkana.

Species list

Phylum Chordata
Class Actinopterygii
Order Polypteriformes
Family Polypteridae

Polypterus bichir Lacepède, 1803: Figure 3a

Polypterus bichir Lacepède (1803): 340. — Habteselassie (2012): 57; Eschmeyer et al. (2016); Froese & Pauly (2016).

Polyptère bichir Geoffroy St. Hilaire (1802): 97. — Günther (1896): 218; Boulenger (1909): 6; Tedla (1973): 19; Hopson & Hopson (1982): 290; the generic name lacked latinization during the original description (Eschmeyer et al. 2016).

Polypterus bichir bichir — Gosse (1984):19; Seegers et al. (2003): 28.

Material examined: Table 2

Seventeen dorsal finlets; 67 scales in the lateral line; terminal mouth with small unicuspid teeth on jaws; body dark brown; sampled in the Ethiopian part of Lake Turkana.

Polypterus senegalus Cuvier, 1829: Figure 3b

Polypterus senegalus Cuvier (1829): 330. — Boulenger (1905): 36; Boulenger (1909): 14; Habteselassie (2012): 56; Eschmeyer et al. (2016); Froese & Pauly (2016).

Polypterus senegalus senegalus — Seegers et al. (2003): 28.

Material examined: Table 2

Nine dorsal finlets; 57 scales in the lateral line; terminal mouth with small unicuspid teeth on jaws; body grayish; sampled in the lower Omo River.

Order Osteoglossiformes
Family Arapaimidae

Heterotis niloticus (Cuvier, 1829): Figure 3c

Sudis niloticus Cuvier (1829): 328.

Heterotis niloticus — Boulenger (1906): 559; Boulenger (1909): 149; Tedla (1973): 21; Seegers et al. (2003): 28; Habteselassie (2012): 59; Eschmeyer et al. (2016); Froese & Pauly (2016).

Heterotis niloticus (Cuvier, 1929) — Hopson & Hopson (1982): 291.

Material examined: Table 2

Terminal mouth with unicuspid teeth; body scales large and strong; dorsal fin long, with more than 30 soft rays, positioned on the posterior body close to caudal; caudal fin round; sampled in the Ethiopian part of Lake Turkana.

Family Mormyridae

Mormyrus caschive Linnaeus, 1758: Figure 3d

Mormyrus caschive Linnaeus (1758): 327. — Habteselassie (2012): 64; Eschmeyer et al. (2016); Froese & Pauly (2016).

Mormyrus caschive Linnaeus (1757): 398. — Boulenger (1909): 136.

Material examined: Table 2

Mouth terminal; proboscis-like snout straight, not curved downward; dorsal fin rays more than 75; laterally compressed; dark violet in color; sampled in the lower Omo River and the Ethiopian part of Lake Turkana; a new record for the latter.

Mormyrus kannume Forsskål, 1775: Figure 3e

Mormyrus kannume Forsskål (1775): 74. — Hopson & Hopson (1982): 293; Seegers et al. (2003): 29; Habteselassie (2012): 64; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

Mouth terminal; proboscis-like snout slightly curved downward; dorsal fin rays fewer than 75; sampled in the lower Omo River.

Mormyrops anguilloides (Linnaeus, 1758): Figure 3f

Mormyrus anguilloides Linnaeus (1758): 327.

Mormyrops anguilloides — Seegers et al. (2003): 29; Habteselassie (2012): 68; Eschmeyer et al. (2016); Froese & Pauly (2016).

Oxyrhynchus deliciosus Leach (1818): 410.

Mormyrops deliciosus — Boulenger (1905): 37; Boulenger (1909): 32; Tedla (1973): 20.

Material examined: Table 2

Mouth terminal; body laterally compressed; snout moderately long; thin white sheath covering snout including eye; head depressed; body not deep, anterior body with dark reddish wash; dorsal fin about as long as anal fin, both located near caudal; dark violet in color; sampled in the lower Omo River.

Hyperopisus bebe (Lacepède, 1803): Figure 3g

Mormyrus bebe Lacepède (1803): 619.

Hyperopisus bebe — Hopson & Hopson (1982): 292; Seegers et al. (2003): 28; Habteselassie (2012): 66; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

Mouth terminal; snout round and short; thin white sheath covering snout including eyes; body laterally compressed; dorsal fin much shorter than anal fin; dorsal fin located posteriorly, near caudal; dark brown in color; sampled in the lower Omo River.

Figure 3. Species of fishes of the lower Omo River and Ethiopian part of Lake Turkana. **a.** *Polypterus bichir*, 73 cm SL, ZNHM-F-0001. **b.** *Polypterus senegalus*, 30 cm SL, ZNHM-F-0002–3. **c.** *Heterotis niloticus*, 60 cm SL, ZNHM-F-0004. **d.** *Mormyrus caschive*, 37 cm SL, ZNHM-F-0005–6. **e.** *Mormyrus kannume*, 41 cm SL, ZNHM-F-0007. **f.** *Mormyrops anguilloides*, 42 cm SL, ZNHM-F-0008–9. **g.** *Hyperopisus bebe*, 37 cm SL, ZNHM-F-0010–12; **h.** *Pollimyrus petherici*, 19 cm SL, ZNHM-F-0013–14. **i.** *Hydrocynus vittatus*, 33 cm SL, ZNHM-F-0015–18. **j.** *Hydrocynus forskahlii*, 38 cm SL, ZNHM-F-0019–20. **k.** *Alestes baremoze*, 35 cm SL, ZNHM-F-0021–22. **l.** *Brycinus nurse*, 11.3 cm SL, ZNHM-F-0023–24. **m.** *Citharinus citharus intermedius*, 40 cm SL, ZNHM-F-0025–30. **n.** *Distichodus nefasch*, 40 cm SL, ZNHM-F-0031–32. **o.** *Labeo horie*, 31 cm SL, ZNHM-F-0033–34. **p.** *Labeo niloticus*, 48 cm SL, ZNHM-F-0035–38.

Pollimyrus petherici (Boulenger, 1898): Figure 3h

Marcusenius petherici Boulenger (1898): 7 — Boulenger (1909): 82; Boulenger (1916): 162.

Pollimyrus petherici — Habteselassie (2012): 70; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

Snout relatively short; dorsal fin originating well anterior of anal fin origin, relatively long with up to 36 rays; both dorsal and anal fins located near caudal; dorsal profile tends to be concave; sampled in the lower Omo River.

Order Characiformes
Family Alestidae

Hydrocynus vittatus Castelnau, 1861: Figure 3i

Hydrocynus vittatus Castelnau (1861): 65. — Seegers et al. (2003): 36; Habteselassie (2012): 75 ; Eschmeyer et al. (2016); Froese & Pauly (2016).

Hydrocyon lineatus Bleeker (1863): 125. — Boulenger (1909): 182; Tedla (1973): 23.

Hydrocynus lineatus — Hopson & Hopson (1982): 296.

Material examined: Table 2

Teeth unicuspid, in a single row on each jaw, visible when mouth is closed; adipose eyelid present; two rows of scales between the scaly process at pelvic fins and lateral line; dorsal fin tip, adipose fin and caudal fin fork edges black; body silvery with light black stripes; sampled in the lower Omo River and the Ethiopian part of Lake Turkana; a new record for the former.

Hydrocynus forskahlii (Cuvier, 1819): Figure 3j

Hydrocyon forskahlii Cuvier (1819):354.

Hydrocynus forskahlii — Seegers et al. (2003): 36; Habteselassie (2012): 74; Froese & Pauly (2016).

Hydrocynus forskahlii — Eschmeyer et al. (2016).

Hydrocynus forskalii — Paugy (1984): 170.

Hydrocyon forskali — Pellegrin (1905): 291; Pellegrin (1935): 133; Tedla (1973): 22.

Hydrocyon forskalii — Boulenger (1909): 180; Hopson & Hopson (1982): 295.

Material examined: Table 2

Teeth unicuspid, in a single row on each jaw, visible when mouth is closed; adipose eyelid present; two rows of scales between the scaly process at pelvic fins and lateral line; tip of dorsal fin, inner edges of caudal fin, and adipose fin uniformly grayish; upper dorsal part silvery; lower caudal lobe orange-red; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Alestes baremoze (Joannis, 1835): Figure 3k

Myletes baremoze Joannis (1835):31.
Alestes baremoze — Seegers et al. (2003): 35; Habteselassie (2012): 76; Eschmeyer et al. (2016); Froese & Pauly (2016).
Alestes baremose — Boulenger (1905): 40; Boulenger (1909): 195; Pellegrin (1935): 133; Tedla (1973): 24; Hopson & Hopson (1982): 298.
Alestes baremoze tchadense Blache (1964): 74. — Paugy (1984): 142.

Material examined: Table 2

Dorsal fin equidistant between pelvic and anal fins or nearer to the latter; anal fin moderately long, with 25–30 branched rays; edges of caudal fin finely black; adipose eyelid present; more than 38 scales in the lateral line; body slightly laterally compressed; dorsal surface dark silver; lower caudal lobe orange red; pelvic and anal fins with orange red wash; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Brycinus nurse (Rüppell, 1832): Figure 3l

Myletes nurse Rüppell (1832): 12.
Brycinus nurse — Habteselassie (2012): 77; Froese & Pauly (2016).
Alestes nurse — Boulenger (1905): 40; Boulenger (1909): 205; Tedla (1973): 24; Hopson & Hopson (1982): 298; Paugy (1984): 155.
Brachyalestes nurse — Eschmeyer et al. (2016).
Brachyalestes rüppellii Günther (1864): 315.
Alestes rüppellii — Günther (1896): 223.
Alestes nurse nana Pellegrin (1935): 133.
Brycinus nurse nana — Seegers et al. (2003): 35.

Material examined: Table 2

Dorsal fin above or only slightly anterior to pelvic fin; head slightly flattened; teeth in outer row of premaxilla 8; sides silvery; unpaired fins bright red; paired fins colorless to light orange; dorsal and sides of the body silvery; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Family Citharinidae

Citharinus citharus intermedius Worthington (1932): Figure 3m

Citharinus citharus intermedius Worthington (1932): 123 — Pellegrin (1935):134; Daget (1984): 214; Seegers et al. (2003): 35.
Serrasalmus citharus Geoffroy St. Hilaire (1809): 40.
Citharinus citharus — Boulenger (1909): 291; Habteselassie (2012): 85; Eschmeyer et al. (2016); Froese & Pauly (2016).
Citharinus citharis — Hopson & Hopson (1982): 306.
Citharinus geoffroii Cuvier (1829): 313. — Günther (1896): 223.

Material examined: Table 2

Mouth terminal, with unicuspid teeth on lip; body laterally compressed, covered with cycloid scales; dorsal and lateral upper half dark olive, lateral lower half white; pelvic, anal and lower lobe of caudal fin pinkish; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Family Distichodontidae

Distichodus nefasch (Bonnaterre, 1788): Figure 3n

Salmo nefasch Bonnaterre (1788): 169. — Habteselassie (2012): 82; Eschmeyer et al. (2016); Froese & Pauly (2016).
Salmo niloticus Linnaeus *in* Hasselquist (1762): 422.
Distichodus niloticus — Boulenger (1909): 273; Tedla (1973): 26; Hopson & Hopson (1982): 307; Seegers et al. (2003): 35.
Distichodus niloticus (Linnaeus, 1766) — Boulenger (1905): 42.
Distichodus rudolphi Günther (1896): 223.

Material examined: Table 2

Mouth subinferior, with small bicuspid teeth in two rows in each jaw; more than 20 dorsal fin rays; more than 90 lateral line scales; more than 15 scales between lateral line and pelvic fin; body slightly laterally compressed, covered with ctenoid scales; dorsal surface dark silver, lateral lower half light grey; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Order Cypriniformes
Family Cyprinidae

Labeo horie Heckel, 1847: Figure 3o

Labeo horie Heckel (1847): 304. — Boulenger (1909): 306; Pellegrin (1935): 135; Hopson & Hopson (1982): 307; Seegers et al. (2003); Habteselassie (2012): 109.

Material examined: Table 2

No teeth on the jaws; inferior mouth with 1 pair of minute barbels present; maximum 14 branched dorsal fin rays; upper edge of dorsal fin straight or slightly convex; labial folds rather poorly developed; 40–44 scales in the lateral line; no transverse plicae of papillae on the inner sides of the lips; dorsal surface dark olive; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Labeo niloticus (Linnaeus, 1758): Figure 3p

Cyprinus niloticus Linnaeus (1758): 322.
Labeo niloticus (Linnaeus, 1758) — Froese & Pauly (2016).
Cyprinus niloticus Forsskål (1775): 71.
Labeo niloticus — Boulenger (1909): 304; Habteselassie (2012): 107.

Material examined: Table 2

No teeth on the jaws; inferior mouth with one pair of minute barbels; more than 14 branched dorsal fin rays; upper edge of dorsal fin often concave; 41–45 scales in the lateral line; no transverse plicae of papillae on the inner sides of the lips; dorsal surface dark olive; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Labeo coubie Rüppell, 1832: Figure 4a

Labeo coubie Rüppell (1832): 11. — Boulenger (1909): 317; Habteselassie 2012: 108; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

No teeth on the jaws; inferior mouth with one pair of minute barbels; maximum 14 branched dorsal fin rays; upper edge of dorsal fin convex or straight; labial folds relatively well developed; 36–40 scales in the lateral line; transverse plicae of papillae present on the inner sides of the lips; sampled in the Ethiopian part of Lake Turkana (a new record).

Order Siluriformes
Family Auchenoglanididae

Auchenoglanis biscutatus (Geoffroy St. Hilaire, 1809): Figure 4b

Pimelodus biscutatus Geoffroy St. Hilaire (1809): 320.
Auchenoglanis biscutatus — Boulenger (1911): 367; Habteselassie (2012): 140; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

Scales absent; inferior mouth with three pairs of barbels; maxillary barbels long, reaching the posterior edge of eye, in contrast to *A. occidentalis*; caudal truncate; body medium brown with dark brown spots; lower lateral body part with reddish wash; specimens from the lower Omo River with reddish fins; sampled in the lower Omo River and the Ethiopian part of Lake Turkana; a new record for the latter.

Auchenoglanis occidentalis (Valenciennes *in* Cuvier & Valenciennes, 1840): Figure 4c

Pimelodus occidentalis Valenciennes *in* Cuvier & Valenciennes, 1840: 203.
Auchenoglanis occidentalis — Habteselassie (2012): 141; Eschmeyer et al. (2016); Froese & Pauly (2016).
Auchenoglanis occidentalis — Boulenger (1905): 48; Boulenger (1911): 369; Hopson & Hopson (1982).
Auchenoglanis occidentalis — Seegers et al. (2003).

Material examined: Table 2

Scales absent; inferior mouth yellowish, with three pairs of barbels; maxillary barbels short, not reaching the posterior edge of eye; caudal truncate; moderate-sized black spots on body, small black spots on caudal fin; caudal fin orange red; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Family Clariidae

Clarias gariepinus (Burchell, 1822): Figure 4d

Silurus gariepinus Burchell (1822): 425.
Clarias gariepinus (Burchell, 1822) — Boulenger (1911): 228; Seegers et al. (2003): 37; Habteselassie (2012): 151; Eschmeyer et al. (2016); Froese & Pauly (2016).
Clarias lazera Valenciennes *in* Cuvier & Valenciennes (1840): 372.
Clarias lazera — Boulenger (1911): 232; Tedla (1973): 63; Hopson & Hopson (1982): 320.

Material examined: Table 2

Scales absent; body elongate; subinferior mouth with four pairs of barbels; dorsal fin long, extending to the base of caudal; anal fin long, extending almost to caudal fin; no adipose fin; caudal fin round; sampled in the Ethiopian part of Lake Turkana.

Family Bagridae

Bagrus bajad (Forsskål, 1775): Figure 4e

Silurus bajad Forsskål (1775): 66.
Bagrus bajad — Seegers et al. (2003): 36; Habteselassie (2012): 142; Eschmeyer et al. (2016); Froese & Pauly (2016).
Bagrus bayad — Boulenger (1911): 305.

Material examined: Table 2

Scales absent; head dorsally flattened; mouth subinferior with four pairs of barbels; caudal fin forked, upper and lower lobes extending into long filaments; the first branched dorsal fin ray extending into short filament; long fleshy adipose fin present; dorsally brown, laterally silver; some specimens dark brown; body gray; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Bagrus docmak (Forsskål, 1775): Figure 4f

Silurus docmak Forsskål (1775): 65.
Bagrus docmak — Seegers et al. (2003): 36; Habteselassie (2012): 143; Eschmeyer et al. (2016); Froese & Pauly (2016).
Bagrus docmac — Boulenger (1906): 559; Boulenger (1911): 308; Tedla (1973): 60; Hopson & Hopson (1982): 316.

Material examined: Table 2

Scales absent; head dorsally flat; mouth subinferior with four pairs of barbels; caudal fin forked, lower lobe not extending into long filament; the first branched dorsal fin ray not extending into short filament; long fleshy adipose fin present; body pale red in fresh specimens; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Family Claroteidae

Chrysichthys turkana Hardman, 2008: Figure 4g

Chrysichthys turkana Hardman (2008): 27
Pimelodus auratus Geoffroy St. Hilaire (1809): 322.
Chrysichthys auratus — Boulenger (1911): 325; Hopson & Hospon (1982): 317; Seegers et al. (2003): 36; Habteselassie (2012): 145; Eschmeyer et al. (2016); Froese & Pauly (2016).
Chrysichthys auratus auratus — Risch (1986): 14; Mo (1991): 148.

Material examined: Table 2

Scales absent; head flat; mouth subinferior with four pairs of short barbels, not extending beyond head; head golden, dorsally golden dark, laterally golden white; dorsal fin with six unbranched rays; caudal fin forked; specimens of *Chrysichthys* collected from both the Omo River and Lake Turkana during the present study are identified as *Chrysichthys turkana* sensu Hardman (2008).

Family Malapteruridae

Malapterurus minjiriya Sagua, 1987: Figure 4h

Malapterurus minjiriya Sagua (1987): 78. — Habteselassie (2012): 156; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

Scales absent; three pairs of unbranched barbels; rayed dorsal fin absent; fleshy adipose fin present; pectoral fins placed low on the body; anal fin with 10 soft rays; caudal fin round or slightly truncate; sampled in the lower Omo River. The occurrence of this species in the Omo-Turkana

Figure 4. Species of fishes of the lower Omo River and Ethiopian part of Lake Turkana. **a.** *Labeo coubie*, 24 cm SL, ZNHM-F-0039. **b.** *Auchenoglanis biscutatus*, 28 cm SL, ZNHM-F-0040–41. **c.** *Auchenoglanis occidentalis*, 29 cm SL, ZNHM-F-0042–43. **d.** *Clarias gariepinus*, 72 cm SL, ZNHM-F-0044–45. **e.** *Bagrus bajad*, 54 cm SL, ZNHM-F-0046–47. **f.** *Bagrus docmak*, 43 cm SL, ZNHM-F-0048–49. **g.** *Chrysichthys turkana*, 23 cm SL, ZNHM-F-0050–52. **h.** *Malapterurus minjiriya*, 13 cm SL, ZNHM-F-0053. **i.** *Synodontis filamentosus*, 26 cm SL, ZNHM-F-0054–55. **j.** *Synodontis schall*, 32 cm SL, ZNHM-F-0056–62. **k.** *Schilbe mystus*, 32 cm SL, ZNHM-F-0063. **l.** *Schilbe uranoscopus*, 30 cm SL, ZNHM-F-0064–67. **m.** *Oreochromis niloticus*, 33 cm SL, ZNHM-F-0068–69. **n.** *Lates niloticus*, 45 cm SL, ZNHM-F-70–76. **o.** *Tetraodon lineatus*, 28 cm SL, ZNHM-F-0077.

system was also noted by Golubtsov and Berendzen (1999); sampled in the lower Omo River during this study.

Family Mochokidae

Synodontis filamentosus Boulenger, 1901: Figure 4i

Synodontis filamentosus Boulenger (1901): 10. — Boulenger (1911): 460; Eschmeyer et al. (2016); Froese & Pauly (2016).
Synodontis filamentosa — Habteselassie (2012): 166.

Material examined: Table 2

Scales absent; dorsal fin spine extends into very long filament approximately half the length of the spine; soft rays not extending into filament; body dark olive; sampled in the lower Omo River and the Ethiopian part of Lake Turkana; a new record for both localities.

Synodontis schall (Bloch & Schneider, 1801): Figure 4j

Silurus schall Bloch & Schneider (1801): 385.
Synodontis schall — Boulenger (1911): 404; Pellegrin (1935): 135; Tedla (1973): 66; Hopson & Hopson (1982): 323; Habteselassie (2012): 170; Eschmeyer et al. (2016); Froese & Pauly (2016).
Synodontis schal — Günther (1896): 218, 220.
Synodontis schall — Seegers et al. (2003): 39.

Material examined: Table 2

Scales absent; dorsal fin spine not extending into filament, feebly serrated posteriorly, smooth anteriorly, except for a few apical spines, also weak serration on lower anterior half in large individuals; first soft dorsal fin ray extends into short (rarely long) filament; no basal marginal membrane on maxillary barbel; body dark brown; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Family Schilbeidae

Schilbe mystus (Linnaeus, 1758): Figure 4k

Silurus mystus Linnaeus (1758): 305.
Schilbe mystus — Habteselassie (2012): 174; Eschmeyer (2014).

Material examined: Table 2.

Scales absent; mouth terminal with four pairs of barbels; small fleshy adipose fin present far behind the small rayed dorsal fin; anal fin long, extending from pelvic fins to

caudal, with more than 63 rays; body laterally compressed; head profile rises gradually to dorsal fin; dorsal surface light brown, lateral side silvery white; fins with reddish wash; sampled in the lower Omo River.

Schilbe uranoscopus Rüppell, 1832: Figure 4l

Schilbe uranoscopus Rüppell (1832): 4. — Boulenger (1911): 296; Hopson & Hopson (1982): 319; Seegers et al. (2003): 37; Habteselassie (2012): 174; Eschmeyer et al. (2016); Froese & Pauly (2016).

Material examined: Table 2

Scales absent; mouth terminal with four pairs of barbels; adipose fin absent; anal fin long extending from pelvics to caudal, with more than 63 rays; body laterally compressed; head dorsally horizontal, with nape rising abruptly from occiput to the dorsal fin; dorsal surface light brown, lateral side silvery white; fins with reddish wash; sampled in the lower Omo River and the Ethiopian part of Lake Turkana; a new record for the former.

Order Perciformes
Family Cichlidae

Oreochromis niloticus (Linnaeus, 1758): Figure 4m

Perca nilotica Linnaeus (1758): 290.

Oreochromis niloticus — Habteselassie (2012): 195; Eschmeyer et al. (2016); Froese & Pauly (2016).

Chromis niloticus Hasselquist (1757): 346. — Günther (1896): 218.

Tilapia nilotica (Linné, 1757) — Boulenger (1915): 162; Pellegrin (1935): 137.

Tilapia nilotica (Linnaeus, 1757): Tedla (1973): 70.

Sarotherodon niloticus (Linnaeus, 1757) — Hopson & Hopson (1982): 332.

Tilapia cancellata Nichols (1923): 2.

Oreochromis niloticus cancellatus — Trewavas & Teugels (1991): 330.

Tilapia vulcani Trewavas (1933): 315.

Oreochromis niloticus vulcani (Trewavas, 1933) — Seegers et al. (2003): 44.

Material examined: Table 2

Mouth terminal with bicuspid teeth on the outer jaws; dark vertical bands on flank, caudal peduncle and caudal fin; scales between pelvic and pectoral fins distinctly smaller than those on the rest of the body; body light grey, each scale with a black spot; black opercular spot; pectoral fin red; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Family Latidae

Lates niloticus (Linnaeus, 1758): Figure 4n

Labrus niloticus Linnaeus (1758): 286.

Lates niloticus — Seegers et al. (2003): 42; Habteselassie (2012): 189; Eschmeyer et al. (2016); Froese & Pauly (2016); Pellegrin (1935): 137; Hopson & Hopson (1982): 327.

Lates niloticus rudolfianus Worthington (1932): 133.

Material examined: Table 2

Terminal mouth with villiform teeth; dorsal fin long, deeply notched into anterior and posterior regions; seven spines in the anterior dorsal fin; caudal fin rounded; body scales ctenoid; single complete lateral line present; body silvery; sampled in the lower Omo River and the Ethiopian part of Lake Turkana.

Order Tetraodontiformes
Family Tetraodontidae

Tetraodon lineatus Linnaeus, 1758: Figure 4o

Tetraodon lineatus Linnaeus (1758): 333. — Seegers et al. (2003): 47; Habteselassie (2012): 199; Eschmeyer et al. (2016); Froese & Pauly (2016).

Tetrodon fahaka Linnaeus *in* Hasselquist (1762): 441. — Boulenger (1916): 143.

Tetraodon strigosus Bennett (1834): 45.

Tetraodon fahaka — Hopson & Hopson (1982): 337.

Tetraodon fahaka rudolfianus Deraniyagala (1948): 29.

Material examined: Table 2

Dorsal fin short, located posteriorly; body scaleless, head and body covered with small thin spines; lateral line absent; a pair of fused teeth at the front of each jaw; yellow longitudinal bands on the body; caudal fin truncate to round, yellow in color; yellow longitudinal bands on body; ventral fins absent; sampled in the Ethiopian part of Lake Turkana.

Diversity indices

The values for the Shannon diversity, evenness indices and the permutation p are summarized in Table 3. The differences in the number of specimens and Shannon diversity index between the lower Omo River and the Ethiopian part of Lake Turkana were statistically significant ($p < 0.05$; Table 3). The number of specimens was higher for the lake (n = 3,563) whereas the Shannon diversity index was higher for the lower Omo River (H' = 2.43) than for the Ethiopian part of Lake Turkana (H' = 2.20). The expected species richness for the lower Omo River (i.e., the smaller sample) rarefied from the Ethiopian part of Lake Turkana (i.e., the larger sample) at a subsample size of n = 811 was 19 ± 1.5 at the 95% Confidence Interval (CI) (Figure 5). Figure 6 indicates the rank order abundance plot of the two habitats. The Whittaker's beta diversity index (β_w) for the lower Omo River and the Ethiopian part of Lake Turkana system was 0.24.

DISCUSSION

Analyses of fish sampled indicate that diversity was higher in the sampled section of the Omo River than in the lake, but relative abundance was higher in the lake. Species richness in the lower Omo River (i.e., 26 species) was above the 95% CI of its expected (rarefied) richness of 19 ± 1.5 species. Thus, differences in richness between the two environments could not be ascribed to differences in abundance or sampling effort (Magurran 2004; Gotelli & Colwell 2011). Both the Shannon evenness indices (Table 3) and the rank order abundance plots (Figure 6) showed that species abundance distribution was more

even for the lower Omo River fishes. Therefore, the higher value of Shannon diversity index for the lower Omo River (Table 3), despite its lower overall relative abundance, should be accounted for by its greater evenness coupled with its relatively higher species richness (*S*).

Sites sampled during the present study represented only a small portion of the basin. Therefore, an analysis combining the present data and past studies is valuable for an understanding of the basin's ichthyofaunal diversity. Based on such analysis, 79 valid native fish species referable to 44 genera, 22 families and nine orders can be recognized for the entire Omo-Turkana basin, for which an annotated checklist is provided in Table 4. Besides the valid native species, the Omo-Turkana system also harbors one exotic subspecies i.e. *Oreochromis spilurus spilurus* and three potentially undescribed species, i.e., *Chiloglanis* sp. "Kerio", *Marcusenius* sp. "Turkwell" and *'Enteromius'* spec. "Baringo", in the Kerio and Turkwell basins (Seegers et al. 2003). In this basin-wide analysis, the Omo River still retains a greater richness at 63 (79.75%) fish species while Lake Turkana harbors only 55 (69.62%). Within Omo-Turkan basin, 24 species are restricted to the Omo River system (Table 4), of which five (*Enteromius arambourgi*, *Garra chebera*, *Neobola bottegoi*, *Afronemacheilus kaffa* and *Aplocheilichthys jeanneli)* are endemic to the river basin. However, the status of *N. bottegoi* as endemic to the Omo River (Lévêque et al. 1991) is not supported as the species also occurs in Somaliland (Auata River, tributary of Daua River), which is its type locality. Additionally, the current status of *Andersonia leptura* in the Omo River is uncertain as it has not been recorded since its first capture there in the 1930s (Table 4). *Garra makiensis*, cited as occurring in the Omo-Gibe River by Stiassny & Getahun (2007), is apparently endemic to the Awash River and Lake Zeway basins in the central portion of the Ethiopian Rift Valley (Boulenger 1909; Golubtsov et al. 2012). Sixteen species are restricted to Lake Turkana, nine of these are endemic to the lake (Table 4). *Citharinus citharus intermedius* and *Chrysichthys turkana* are endemic to the Lake Turkana and Omo River, thus increasing the total number of endemic species or subspecies for the Lake Turkana and Omo River (excluding *N. bottegoi*) to 11 and six, respectively (Table 4). It is, however, worth noting that the present status of some species reported from Lake Turkana is also uncertain. In particular *Brycinus macrolepidotus*, *Labeobarbus nedgia*, *L. intermedius*, *Labeo cylindricus* and *Synodontis frontosus* have not been recently sampled in the lake (Table 4). In contrast, these species have recently been found in the Omo River system, suggesting their riverine occurrence (Baron et al. 1997; Mohammed 2014). As a result, the actual number of valid fish species for Lake Turkana could decrease from 55 to 51 (63.75% of the basin's total richness). Overall, compared to the great African lakes such as Victoria, Tanganyika and Malawi, which are dominated by endemic cichlids, Lake Turkana retains a Nilotic riverine fauna with low diversity (Kolding 1989). The lake is also characterized by a low endemism with a maximum of 11 (13.75%) endemic species and subspecies (Table 4). The low endemism of the lake, and the basin as a whole, is apparently due to its historical connections to the White Nile River system, the recent connection being between 10,000–5,000 years ago, when the lake achieved its historical high levels (+77 to +80 m its present water level of 365±5 m a.s.l.) (Harvey & Grove 1982).

At the family level, the Cyprinidae are the largest group in the entire Omo-Turkana system comprising 22 species (27.85% of the basin's total richness), despite their poor presence in the present study. They occur in both the lacustrine and riverine habitats. In the basin, Nemacheilidae and Amphiliidae are known from the Omo River while three families (Protopteridae, Gymnarchidae and Tetraodontidae) are known from Lake Turkana. Mormyridae remains largely a riverine family with most of its species confined to the Omo River system. Confinement of this family to a riverine habitat could likely be attributed to the high conductivity of Lake Turkana's waters (2,342.47 µS/cm, recorded during the present study) which interferes with the current generating capacity of the electric organs of these fishes (Greenwood 1994; Hopkins 1999).

Previous studies addressing the Ethiopian drainages provided ichthyofaunal diversity for the entire Omo-Turkana Basin but lacked data on the extent of fish diversity in the Ethiopian part of the lake (Golubtsov & Mina 2003; Golubtsov & Darkov 2008). Of all valid native fish species reported from Lake Turkana (51 species), only 24 species could be verified for the Ethiopian part of the lake based on the present collections (Table 2). Accordingly, 65 species in 39 genera, 20 families and seven orders can be recognized for the Omo-Turkana basin within the limits of Ethiopia pending further sampling efforts. Thus, the present study puts the Ethiopian Omo-Turkana basin in third place,

Table 3. Summary of specimen numbers (*n*) and diversity indices for the lower Omo River (OR) and the Ethiopian part of Lake Turkana (LT) based on the present data; *represents statistically significant *p* values (i.e, < 0.005).

Parameter	OR	LT	Permutation *p*
Number of specimens (*n*)	823	3,563	< 0.005*
Species richness (*S*)	26	24	0.972
Shannon diversity index (*H'*)	2.43	2.20	< 0.005*
Shannon evenness index (*J'*)	0.75	0.69	0.051

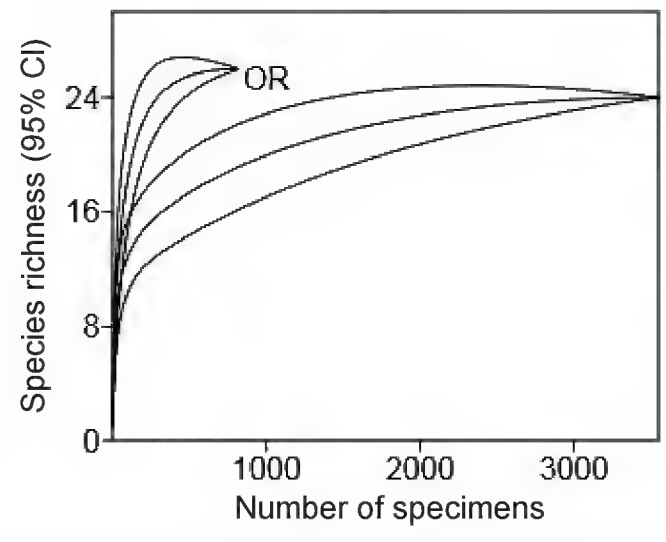

Figure 5. Individual based rarefaction analysis for the lower Omo River (*n* = 823) and the Ethiopian part of Lake Turkana (*n* = 3,563); CI = Confidence Interval.

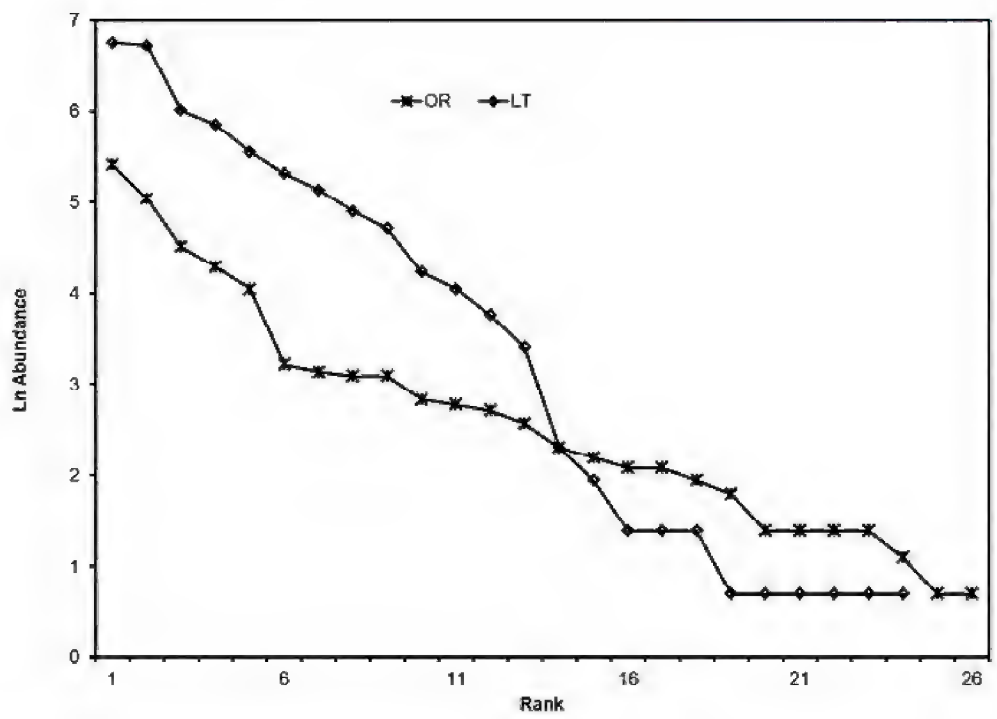

Figure 6. Rank order abundance plots for fish communities of the lower Omo River (OR) and the Ethiopian part of Lake Turkana (LT).

after the Baro-Akobo (Ethiopian White Nile, 113 species) and Abay (Ethiopian Blue, 77 species) basins, in terms of ichthyofaunal diversity. Similar to most other basins of Ethiopia, with the exception of the Blue Nile (Golubtsov & Mina 2003; Getahun 2007), it is characterized by a low endemism. So far, of the 10 species and one subspecies endemic to Lake Turkana, only *C. citharus intermedius* and *Chrysichthys turkana* are known from the Ethiopian waters. The Ethiopian parts of the Omo-Turkana basin house five species and one subspecies endemic to the Omo River system and one species (*Labeobarbus nedgia*) endemic to Ethiopia. An artificial identification key for the fish species occurring within the limit of Ethiopia is provided in the Appendix.

Based on the present collections, the rate of turnover in fish species composition between the lower Omo River and the Ethiopian part of Lake Turkana, measured as Whittaker's beta diversity index, was reasonably high (βw = 0.24). Seven species, i.e., *Polypterus senegalus, Mormyrus kannume, Mormyrops anguilloides, Hyperopisus bebe, Pollimyrus petherici, Malapterurus minjiriya* and *Schilbe mystus,* were recorded only from the lower Omo River. Correspondingly, five species, i.e., *Polypterus bichir, Heterotis niloticus, Labeo coubie, Clarias gariepinus* and *Tetraodon lineatus* were recorded only from Lake Turkana. The turnover in species composition between the two systems is attributable

Table 4. Annotated checklist of the native freshwater fishes of the Omo-Turkana system with local names (in Daasanach language) where available, historical and present records, notes on valid scientific names and synonyms, brief distribution account, and maximum length (total length TL, standard length SL or fork length FL) reported for the basin or elsewhere; family-group name follows Laan et al. (2014) for Arapaimidae and Nemacheilidae.

Order/family/species/local name(s) where available	Annotations on occurrence in the basin, scientific names, distribution elsewhere, and maximum length (TL/SL/FL)
CERATODONTIFORMES	
Protopteridae (1 species)	
Protopterus aethiopicus Heckel, 1851	Known only from three records from Lake Turkana by the Kenyan Marine and Fisheries Research Institute (KMFRI) station on the western shore of the lake at Kalakol; reported as *Protopterus aethiopicus aethiopicus* (Seegers et al. 2003); not known from the Ethiopian part of the lake; Nilo-Sudanic in distribution; 200 cm TL (Seegers et al. 2003).
POLYPTERIFORMES	
Polypteridae (2 species)	
Polypterus bichir Lacepède, 1803 Sharfante	Lake Turkana (Günther 1896; Boulenger 1909; Hopson & Hopson 1982); also recorded from the Kerio River mouth in Kenya (Seegers et al. 2003); Nilo-Sudanic in distribution; 76 cm TL (present data).
Polypterus senegalus Cuvier, 1829 Sharfante	Northeast end of Lake Turkana (Boulenger 1905, 1906, 1909; Hopson & Hopson 1982); Omo River Delta (Pellegrin 1935), and the lower Omo River (Baron et al. 1997); Nilo-Sudanic in distribution; 50.5 cm TL (Seegers et al. 2003).
OSTEOGLOSSIFORMES	
Arapaimidae (1 species)	
Heterotis niloticus (Cuvier, 1829)	Northeast end of Lake Turkana (Boulenger 1906, 1909); subsequently recorded from the lake by Hopson & Hopson (1982); lower Omo River (Baron et al. 1997); Nilo-Sudanic in distribution; 98 cm TL (Seegers et al. 2003).
Mormyridae (7 species)	
Mormyrus caschive Linnaeus, 1758 Achumulo	Lower Omo River (Baron et al. 1997); Nilotic in distribution; 37 cm SL (present data).
Mormyrus kannume Forsskål, 1775 Achumulo	Turkwell River in Kenya; only observed in the Omo River Delta by Hopson & Hopson (1982); lower Omo River (Baron et al. 1997); Kerio system in Kenya (Seegers et al. 2003); Nilotic in distribution; 100 cm TL (Seegers et al. 2003).
Mormyrops anguilloides (Linnaeus, 1758)	Lower Omo River (Baron et al. 1997); widespread throughout sub-Saharan Africa; 42 cm SL (present data).
Hyperopisus bebe (Lacepède, 1803)	Omo River Delta (Hopson & Hopson 1982), lower Omo River (Baron et al. 1997); no scientific collections of the species exist from Lake Turkana, only verbal reports by fishermen of its occurrence in the northern end of the lake (Seegers et al. 2003); thus, past and present records tend to indicate the species to be riverine and probably confined to the Omo River; Nilo-Sudanic in distribution; 51 cm SL (Seegers et al. 2003).
Marcusenius cyprinoides (Linnaeus, 1758)	Lower Omo River (Baron et al. 1997); Nilo-Sudanic in distribution; 33 cm SL (Bigorne 1990).
Pollimyrus petherici (Boulenger, 1898)	Lower Omo River (Baron et al. 1997); Nilotic in distribution; 19 cm SL (present data).
Pollimyrus isidori (Valenciennes, 1847)	Gojeb River, upper tributary of the Omo River system (Dgebuadze et al. 1994); Nilo-Sudanic in distribution; 10.3 cm TL (Lalèyè 2006).
Gymnarchidae (1 speies)	
Gymnarchus niloticus Cuvier, 1829	Northeast end of Lake Turkana (Boulenger 1906, 1909); subsequently Hopson & Hopson (1982) only observed its fishery in the northern end of the lake near Omo River delta; Nilo-Sudanic in distribution; 151 cm TL (Seegers et al. 2003).

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Table 4. *Continued.*

Order/family/species/local name(s) where available	Annotations on occurrence in the basin, scientific names, distribution elsewhere, and maximum length (TL/SL/FL)
CHARACIFORMES	
Alestidae (9 species)	
Hydrocynus vittatus Castelnau, 1861 Kornech	Lake Turkana (WORTHINGTON & RICHARDO 1936); not sampled by HOPSON & HOPSON (1982) who speculated that ecological changes in the lacustrine environment might have deterred riverine species from entering the lake; widespread throughout sub-Saharan Africa; 70 cm SL (SEEGERS et al. 2003).
Hydrocynus forskahlii (Cuvier, 1819) Kornech	Lake Turkana (PELLEGRIN 1905; BOULENGER 1909; HOPSON & HOPSON 1982); Omo River and its delta (PELLEGRIN 1935); lower Omo River (BARON et al. 1997); Nilo-Sudanic and Congolian in distribution; 78 cm SL (SEEGERS et al. 2003).
Alestes baremoze (Joannis, 1835) Lamete	Lake Turkana (BOULENGER 1905; BOULENGER 1909; HOPSON & HOPSON 1982); Omo River and its delta (PELLEGRIN 1935), and subsequently in the lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 46 cm FL (HOPSON & HOPSON 1982).
Alestes dentex (Linnaeus, 1758)	Lake Turkana (BOULENGER 1909; WORTHINGTON 1932; PELLEGRIN 1935; HOPSON & HOPSON 1982); Omo River system (BARON et al. 1997); Nilo-Sudanic in distribution; 55 cm TL (SEEGERS et al. 2003).
Brycinus macrolepidotus Valenciennes, 1850	Omo River system (BOULENGER 1903a, 1906, 1909; PELLEGRIN 1935; BARON et al. 1997); Lake Turkana (BOULENGER 1906, 1909); HOPSON & HOPSON (1982) observed a specimen of 20 cm FL swimming slowly at the surface in a manner characteristic of this species in the Omo River, 10 km upstream from the mouth of the delta; recorded in the Omo River system (BARON et al. 1997); reported as *Alestes macrolepidotus* Cuvier & Valenciennes, 1849; status in Lake Turkana not clear, likely a riverine species from the Omo River; widespread throughout sub-Saharan Africa; 50 cm FL (HOPSON & HOPSON 1982).
Brycinus nurse (Rüppell,1832)	Lake Turkana (GÜNTHER 1896; BOULENGER 1909; HOPSON AND HOPSON 1982); SEEGERS et al. (2003) considered the Lake Turkana population valid as *Brycinus nurse nana* (Pellegrin, 1935) on account of its small size (max. FL 12 cm) in contrast to conspecifics found elsewhere growing to over FL 20 cm; Omo River system (BARON et al. 1997); Nilo-Sudanic in distribution; 12 cm FL (HOPSON & HOPSON 1982; SEEGERS et al. 2003).
Brycinus ferox (Hopson & Hopson, 1982)	Described from Lake Turkana as *Alestes ferox* Hopson & Hopson, 1982; endemic to Lake Turkana; 8.1 cm SL (SEEGERS et al. 2003); 12 cm FL (HOPSON & HOPSON 1982).
Brycinus minutus (Hopson & Hopson, 1982	Described from Lake Turkana as *Alestes minutus* Hopson & Hopson, 1982; endemic to Lake Turkana; 3.7 cm FL (HOPSON & HOPSON 1982); 3.3 cm SL (SEEGERS et al. 2003).
Micralestes elongatus Daget, 1957	Omo River system (BOULENGER 1903a, 1909), and Lake Turkana (HOPSON & HOPSON 1982), reported as *Micralestes acutidens* (Peters, 1852) which apparently was a misidentification because the descriptions given by these authors, particularly the inner dentary teeth which are "monocuspid", is diagnostic for *Micralestes elongatus* (vs. pluricuspid for *M. acutidens*, see PAUGY & SCHAEFER 2007); also recorded from the lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 4.5 cm FL (HOPSON & HOPSON 1982; 6 cm TL (SEEGERS et al. 2003).
Citharinidae (1 species)	
Citharinus citharus intermedius Worthington, 1932 Nakurach	Lake Turkana (GÜNTHER 1896; HOPSON & HOPSON 1982); lower Omo River (PELLEGRIN 1935; BARON et al. 1997); the Omo-Turkana population is valid as *Citharinus citharus intermedius*, endemic to the basin (DAGET 1984; GOSSE & PAUGY 2003; SEEGERS et al. 2003), while *C. citharus citharus* is Nilo-Sudanic in distribution; 58 cm SL (SEEGERS et al. 2003); 65 cm FL (HOPSON & HOPSON 1982).
Distichodontidae (2 species)	
Distichodus nefasch (Bonnaterre, 1788) Golo	*Distichodus rudolphi* Günther, 1896 , which is now a junior synonym of *D. nefasch*, was described from Lake Turkana; reported from the lake by subsequent investigators (BOULENGER 1905, 1909; HOPSON AND HOPSON 1982); recorded in the lower Omo River (Baron et al. 1997); Nilo-Sudanic in distribution; 99 cm FL (HOPSON & HOPSON 1982).
Nannocharax niloticus (Joannis, 1835)	Lower Omo River (BARON et al. 1997); Nilotic in distribution; 5.2 cm (DAGET & GOSSE 1984).
CYPRINIFORMES	
Cyprinidae (22 species)	
*Enteromius arambourgi (*Pellegrin, 1935)	Collected during the "La mission scientifique mission de l'Omo" in the Omo River system at a marsh about 50 km northwest of Sergoit, on the plateau Uasin Gishu, Ethiopia, and described by PELLEGRIN (1935); also subsequently recorded in the lower Omo River by BARON et al. (1997); previously reported as *Barbus arambourgi*; endemic to the Omo River system; 7.8 cm SL (LÉVÊQUE & DAGET 1984).
Enteromius neumayeri (Fischer, 1884)	SEEGERS et al. (2003) mentioned the species as occurring in Lake Turkana system; wide distribution in eastern Africa; previously reported as *Barbus neumayeri*; 10.3 cm SL (SEEGERS et al. 2003).
Enteromius paludinosus (Peters, 1852)	Gojeb River (DGEBUADZE et al. 1994); previously reported as *Barbus paludinosus*; present in east, central and southern Africa; 15 cm SL (SKELTON 1993).
Enteromius perince (Rüppell, 1835)	Omo River system (BARON et al. 1997); previously reported as *Barbus perince*; Nilo-Sudanic in distribution; 8.9 cm SL (LÉVÊQUE 1990).
Enteromius stigmatopygus (Boulenger, 1903)	Lake Turkana (BOULENGER 1911); Omo River and its delta (PELLEGRIN 1935); lower Omo River (BARON et al. 1997); Kalakol and Kataboi streams in Kenya (HOPSON & HOPSON 1982; previously reported as *Barbus stigmatopugus*; also reported as *Barbus werneri* Boulenger, 1905, which is a junior synonym; also mentioned as '*Enteromius*' aff. *stigmatopygus* Boulenger, 1903b casting doubts both on its identification and taxonomic status (SEEGERS et al. 2003); Nilo-Sudanic in distribution; 6.5 cm FL (HOPSON & HOPSON 1982).
Enteromius turkanae (Hopson & Hopson, 1982)	Described from Lake Turkana as *Barbus turkanae* Hopson & Hopson, 1982; previously reported as *Barbus turkanae*; endemic to Lake Turkana; 4.2 cm SL (SEEGERS et al. 2003); 4.8 cm FL (HOPSON & HOPSON 1982).
Labeobarbus nedgia Rüppell, 1835	Lake Turkana (PELLEGRIN 1905); Gibe River, upper to mid tributary of the Omo River (BOULENGER 1906, 1911); subsequently unnoticed and not included in the reviews of the basin's fish diversity (e.g., TEDLA 1973; ROBERTS 1975; LÉVÊQUE et al. 1991); recently collected from Gojeb River, an upper tributary of the Omo river (MOHAMMED 2014); its current status in Lake Turkana is uncertain; endemic to Ethiopia; 70.7 cm SL (NAGELKERKE & SIBBING 1997).

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Table 4. *Continued.*

Order/family/species/local name(s) where available	Annotations on occurrence in the basin, scientific names, distribution elsewhere, and maximum length (TL/SL/FL)
Labeobarbus bynni (Forsskål, 1775)	*Barbus meneliki* Pellegrin, 1905, now a junior synonym of *L. bynni*, was described from Lake Turkana (BANISTER 1973); subsequently the Turkana population was described as the subspecies *B. bynni rudolfianus* Worthington, 1932, which is also synonymised; also recorded in the lake by other investigators (BOULENGER 1911; HOPSON & HOPSON 1982), and in the lower Omo River (BARON et al. 1997); also reported as *Barbus bynni* (FORSSKÅL, 1775); Nilo-Sudanic in distribution; 89 cm FL (HOPSON & HOPSON 1982).
Labeobarbus intermedius (Rüppell, 1835)	Its occurrence in the upper Omo River was noted by BOULENGER (1906, 1911), and it was subsequently recorded from the lower Omo River (BARON et al. 1997); also reported from the Omo River as *Barbus bottegi* Boulenger, 1906, *Barbus gregorii* Boulenger, 1902, *Barbus duchesnii* Boulenger, 1902, *Barbus gudaricus* Boulenger, 1906, *Barbus oreas* Boulenger, 1902; and from Lake Turkana as *Barbus plagiostomus* Boulenger, 1906, which are now all junior synonyms; also occurs in the Kerio-Turkwell river systems (western Turkana drainage basins in Kenya) (SEEGERS et al. 2003); given its old record in Lake Turkana (BOULENGER 1911), the current status of the species in the lake is uncertain; Nilotic in distribution; 48.9 cm SL (SEEGERS et al. 2003).
Labeo cylindricus Peters, 1852 Karitach	Middle and upper Omo River system (BOULENGER 1906, 1909); occurs in Lake Turkana probably as stragglers (HOPSON & HOPSON 1982); recorded in the lower Omo River (BARON et al. 1997), and in the Kerio-Turkwell system in Kenya (SEEGERS et al. 2003); not reported from the Ethiopian part of the lake; Nilotic in distribution, also occurs in Congo and Zambezi provinces; 40 cm TL (SEEGERS et al. 2003).
Labeo horie Heckel, 1847 Karitach	Omo River and Lake Turkana (PELLEGRIN 1935); Lake Turkana (WORTHINGTON & RICHARDO 1936; HOPSON & HOPSON 1982); lower Omo River (BARON et al. 1997); restricted to the Nile basin; 86 cm FL (HOPSON & HOPSON 1982).
Labeo niloticus (Linnaeus, 1758) Karitach	Upper Omo River (BOULENGER 1906, 1909); in lower Omo River (Baron et al. 1997); despite REID's (1985) reference to its occurrence in Lake Turkana, SEEGERS et al. (2003) considered the species' record from the lake (from the collections of the Natural History Museum, London) as a misidentification of *Labeo horie* Heckel, 1847; however, its present collection in both the lower Omo River and the Ethiopian part of Lake Turkana supports its occurrence in Lake Turkana; restricted to the Nile basin; 48 cm SL (this study).
Labeo coubie Rüppell, 1832 Karitach	Lower Omo River (BARON et al. 1997); Nilo-Sudanic and Congolian in distribution; 24 cm SL (this study).
Labeo forskalii Rüppell, 1835 Karitach	Gojeb River, upper tributary of Omo River system (DGEBUADZE et al. 1994); Nilotic in distribution; 36 cm TL (LÉVÊQUE & DAGET 1984).
Garra chebera Habteselassie, Mikschi, Ahnelt & Waidbacher, 2010	Described from Dildil stream, a tributary of Lake Womba in Omo River system (HABTESELASSIE et al. 2010); endemic species known only from its type locality; 7.48 cm SL (HABTESELASSIE et al. 2010).
Garra dembeensis (Rüppell, 1835)	Reported from the Gibe River (BOULENGER 1906, 1909); subsequently recorded in the lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 11.0 cm SL (ECCLES 1992).
Garra quadrimaculata (Rüppell, 1835)	Omo River system (BARON et al. 1997); Eastern Province in southeastern Ethiopia; in southeastern Eritrea and the Arabian Peninsula; 10.7 cm SL (LÉVÊQUE & DAGET 1984).
Raiamas senegalensis (Steindachner, 1870)	Reported from middle and upper Omo River (BOULENGER 1903a, 1906, 1911) as *Barilius loati* Boulenger, 1901, which is now a junior synonym; subsequently recorded from the lower Omo River (BARON et al. 1997); recently collected from the Gojeb River (MOHAMMED 2014); also in the Turkwell drainage (Turkana basin in Kenya) (SEEGERS et al. 2003); Nilo-Sudanic in distribution; 24.5 cm TL (LÉVÊQUE & DAGET 1984).
Leptocypris niloticus (Joannis, 1835)	Middle Omo River system (BOULENGER 1903a, 1911); Lake Turkana (WORTHINGTON & RICHARDO 1936; HOPSON & HOPSON 1982); lower Omo River (BARON et al. 1997); not sampled during the present study; Nilo-Sudanic in distribution; 9.5 cm TL (SEEGERS et al. 2003).
Neobola bottegoi Vinciguerra, 1895	Recorded in the Omo River system by BOULENGER (1903a, 1906, 1911) who also reported its presence in Lake Turkana as *Engraulicypris bottegi* (Vinciguerra, 1895); however, its presence in Lake Turkana has been suspected by subsequent workers to be a misidentification of *Neobola stellae*; lower Omo River (BARON et al. 1997); likely a riverine species restricted to the Omo River; mentioned as endemic to the Omo River (LÉVÊQUE et al. 1991), but the species also occurs in Somaliland (Auata River, tributary of Daua River), the type locality; 7.3 cm TL (LÉVÊQUE & DAGET 1984).
Neobola stellae (Worthington, 1932)	Recorded from Lake Turkana as *Engraulicypris stellae* Worthington, 1932; subsequently also recorded in the lake (PELLEGRIN 1935; HOPSON & HOPSON 1982); endemic to Lake Turkana; 2.3 cm SL (SEEGERS et al. 2003); 3.3 cm FL (HOPSON & HOPSON 1982).
Chelaethiops bibie (Joannis, 1835)	Lake Turkana (HOPSON & HOPSON 1982); Omo River system (BARON et al. 1997); Nilo-Sudanic in distribution; 5.1 cm SL (HOPSON & HOPSON 1982); 5.5 cm TL (SEEGERS et al. 2003).
Nemacheilidae (1 species)	
Afronemacheilus kaffa Prokofiev & Golubtsov, 2013	Identified as *Afronemacheilus abyssinicus* (non Boulenger, 1902) from the Gojeb River (DGEBUADZE et al. 1994), and later described as *Afronemacheilus kaffa* Prokofiev & Golubtsov, 2013; endemic to Omo River basin; 5.5. cm SL (PROKOFIEV & GOLUBTSOV 2013).
SILURIFORMES	
Amphiliidae (1 species)	
Andersonia leptura Boulenger, 1900	Omo River delta (PELLEGRIN 1935); not sampled in subsequent studies or in the present study; current status in the basin is uncertain; Nilo-Sudanic in distribution; 2.8 cm TL (HOPSON & HOPSON 1982).
Auchenoglanididae (2 species)	
Auchenoglanis biscutatus (Geoffroy St. Hilaire, 1809) Dir	Lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 28 cm SL (this study).
Auchenoglanis occidentalis (Valenciennes *in* Cuvier & Valenciennes, 1840)	Lake Turkana (BOULENGER 1911; HOPSON & HOPSON 1982); Lower Omo River (BARON et al. 1997); Nilo-Sudanic and Congolian in distribution; 48 cm SL (SEEGERS et al. 2003); 51 cm TL (HOPSON & HOPSON 1982).
Clariidae (2 species)	
Clarias gariepinus (Burchell, 1822)	Omo River system (BOULENGER 1911); Lake Turkana (WORTHINGTON & RICHARDO 1936; HOPSON & HOPSON 1982); all reported as *Clarias lazera* Cuvier & Valenciennes, 1840, which is now a junior synonym; also recorded in the lower Omo River (BARON et al. 1997); widespread throughout sub-Saharan Africa; 150 cm TL (SEEGERS et al. 2003).

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Table 4. *Continued.*

Order/family/species/local name(s) where available	Annotations on occurrence in the basin, scientific names, distribution elsewhere, and maximum length (TL/SL/FL)
Heterobranchus longifilis (Valenciennes, 1840)	Upper tributaries of the Omo River (BOULENGER 1906, 1911); subsequently HOPSON & HOPSON (1982) cited fishermen's report of its occurrence in the region of the Omo River delta; recorded in the lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 100 cm TL (SEEGERS et al. 2003).
Bagridae (2 species)	
Bagrus bajad (Forsskål, 1775) Nyarabomos	Lake Turkana (WORTHINGTON & RICHARDO 1936; HOPSON & HOPSON 1982); reported as *Bagrus bayad* (Forsskål, 1775), which is a misspelled name; lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 90 cm FL (HOPSON & HOPSON 1982).
Bagrus docmak (Forsskål, 1775) Nyarabomos	Upper Omo River (BOULENGER 1906, 1911); Lake Turkana (HOPSON & HOPSON 1982); lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 110 cm TL (SEEGERS et al. 2003).
Claroteidae (1 species)	
Chrysichthys turkana Hardman, 2008	Identified as *Chrysichthys auratus* (non GEOFFROY ST. HILAIRE, 1809), from Lake Turkana by HOPSON & HOPSON (1982); later, the Turkana population was described as a distinct species, *Chrysichthys turkana* (Hardman 2008); also reported from lower Omo River (BARON et al. 1997); apparently endemic to Lake Turkana and Omo River system; 30 cm FL (HOPSON & HOPSON 1982).
Malapteruridae (2 species)	
Malapterurus minjiriya Sagua, 1987	Omo River system (BARON et al. 1997; GOLUBTSOV & BERENDZEN 1999); Nilo-Sudanic in distribution; White Nile (Baro and Alveiro rivers) in Ethiopia; 51 cm SL (NORRIS 2003).
Malapterurus electricus (Gmelin, 1789)	Omo River Delta (PELLEGIN 1935); Omo River system (BARON et al. 1997); Lake Turkana and Turkwell River system (a southwestern tributary of Lake Turkana in Kenya) (HOPSON & HOPSON 1982); Nilo-Sudanic in distribution; 122 cm TL (SEEGERS et al. 2003).
Mochokidae (7 species)	
Chiloglanis niloticus Boulenger, 1900	Omo River system (BARON et al. 1997); not sampled during the present study; Nilo-Sudanic in distribution; 4.5 cm SL (GOSSE 1986).
Mochokus niloticus Joannis, 1835	Reported from Lake Turkana (BOULENGER 1911; HOPSON & HOPSON 1982) as *Mochocus niloticus* Joannis, 1835, which is a misspelled name; Nilo-Sudanic in distribution; 6.5 cm TL (SEEGERS et al. 2003).
Synodontis filamentosus Boulenger, 1901 Dir	Sampled in both the lower Omo River and the Ethiopian part of Lake Turkana during the present study, also mentioned as *Synodontis filamentosa* Boulenger, 1901 (HABTESILASSIE, 2012); Nilo-Sudanic in distribution; 26 cm SL (OLAOSEBIKAN & RAJI 1998).
Synodontis schall (Bloch & Schneider, 1801) Dir	Lake Turkana by GÜNTHER (1896) as *Synodontis schal* (Bloch & Schneider, 1801), a misspelled name; followed by reports of BOULENGER (1911), PELLEGRIN (1935), HOPSON & HOPSON (1982); lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 43 cm TL (SEEGERS et al. 2003).
Synodontis frontosus Vaillant, 1895 Dir	Northeast end of Lake Turkana (BOULENGER 1906, 1911); upper part of Omo River Delta (HOPSON & HOPSON 1982); lower Omo River (BARON et al. 1997); likely a riverine species confined to the Omo River; Nilo-Sudanic in distribution; 34. 2 cm TL (SEEGERS et al. 2003).
Synodontis serratus Rüppell, 1829 Dir	Lower Omo River (BARON et al. 1997); Nilotic in distribution; 39.5 cm TL (GOSSE 1986).
Synodontis sorex Günther, 1864 Dir	Lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 36.0 cm SL (OLAOSEBIKAN & RAJI 1998).
Schilbeidae (3 species	
Schilbe mystus (Linnaeus, 1758) Iyinte	Lower Omo River (BARON et al. 1997); also in Nile and Zambezi system; 32 cm SL (this study).
Schilbe uranoscopus Rüppell, 1832 Iyinte	Lake Turkana (HOPSON & HOPSON 1982); Nilo-Sudanic in distribution; 34 cm SL (HOPSON & HOPSON 1982); 36 cm TL (SEEGERS et al. 2003).
Schilbe intermedius Rüppell, 1832 Iyinte	Lower Omo River **(**BARON et al. 1997); widely distributed, sub-Saharan Africa; 50 cm SL (DE VOS 2003).
CYPRINODONTIFORMES	
Poeciliidae (2 species)	
Aplocheilichthys rudolfianus (Worthington, 1932)	Described from Lake Turkana as *Haplochilichthys rudolfianus* Worthington, 1932; subsequently recorded in the lake by HOPSON & HOPSON (1982); as *Micropanchax rudolfianus* (Worthington, 1932) (HUBER 1999); endemic to Lake Turkana; 3 cm TL (SEEGERS et al. 2003).
Aplocheilichthys jeanneli (Pellegrin, 1935)	Described from the Omo River Delta as *Haplochilichthys jeanneli* Pellegrin, 1935; subsequently recorded in the Omo River Delta by HOPSON & HOPSON (1982); endemic to the Omo River; 3 cm TL (SEEGERS et al. 2003).
PERCIFORMES	
Cichlidae (7 species)	
Oreochromis niloticus (Linnaeus, 1758)	Lake Turkana (GÜNTHER 1896; WORTHINGTON & RICHARDO 1936; HOPSON & HOPSON 1982); upper Omo River and northeast end of Lake Turkana (BOULENGER 1906, 1915); Omo River (PELLEGRIN 1935; BARON et al. 1997); Nilo-Sudanic in distribution; 64 cm TL (HOPSON & HOPSON 1982).
Sarotherodon galilaeus (Linnaeus, 1758)	Lake Turkana (WORTHINGTON & RICHARDO 1936; HOPSON & HOPSON 1982); reported as *Tilapia galilaea* (Artedi, 1757) or *Sarotherodon galilaeus* (Artedi, 1757); lower Omo River (BARON et al. 1997); Nilo-Sudanic in distribution; 34 cm SL (Seegers et al. 2003); 35 cm TL (HOPSON & HOPSON 1982).
Coptodon zillii (Gervais, 1848)	Lake Turkana (GÜNTHER 1896; PELLEGRIN 1935; BOULENGER 1915; HOPSON & HOPSON 1982); lower Omo River (BARON et al. 1997); previously reported as *Tilapia zillii*; also as *Chromis tristrami* Günther, 1862, which is a junior synonym; Nilo-Sudanic in distribution; 33 cm TL (HOPSON & HOPSON 1982).
Haplochromis rudolfianus Trewavas, 1933	Described from Lake Turkana; subsequently recorded from the lake by HOPSON & HOPSON (1982); listed as *Thoracochromis rudolfianus* (Trewavas, 1933) by LÉVÊQUE et al. (1991); endemic to Lake Turkana; 9.5 cm TL (HOPSON & HOPSON 1982).
Haplochromis macconneli Greenwood, 1974	Described from Lake Turkana; subsequently recorded from the lake by HOPSON & HOPSON (1982); listed as *Thoracochromis macconneli* (Greenwood, 1974) by LÉVÊQUE et al. (1991); endemic to Lake Turkana; 13 cm TL (SEEGERS et al. 2003).

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Table 4. *Continued.*

Order/family/species/local name(s) where available	Annotations on occurrence in the basin, scientific names, distribution elsewhere, and maximum length (TL/SL/FL)
Haplochromis turkanae Greenwood, 1974	Described from Lake Turkana; subsequently recorded from the lake by HOPSON & HOPSON (1982); listed as *Thoracochromis turkanae* (Greenwood, 1974) by LÉVÊQUE et al. (1991); endemic to Lake Turkana; 8.6 cm SL (SEEGERS et al. 2003).
Hemichromis exsul (Trewavas, 1933)	Described from Lake Turkana as *Pelmatochromis exsul* Trewavas, 1933; later on recognized to be misidentification of *Hemichromis bimaculatus* Gill, 1862 (TREWAVAS 1933; HOPSON & HOPSON 1982); listed as as a synonym of *Hemichromis letourneuxi* Sauvage, 1880 by DAGET & TEUGELS (1991); however, according to SEEGERS et al. (2003) the Lake Turkana population probably is a distinct species endemic to the lake; Nilo-Sudanic in distribution; 15 cm TL (HOPSON & HOPSON 1982).
Latidae (2 species)	
Lates niloticus (Linnaeus, 1758)	Reported from Lake Turkana (BOULENGER 1915; HOPSON & HOPSON 1982); *L. niloticus rudolfianus* Worthington, 1932, described from the lake, is now synonymised; also recorded from the Omo River and its delta (PELLEGRIN 1935; BARON et al. 1997); widely distributed in Nilo-Sudanic and Congolian Province; 196 cm TL (HOPSON & HOPSON 1982).
Lates longispinis Worthington, 1932	Described from Lake Turkana as *L. niloticus longispinis* Worthington, 1932, now a valid species; subsequently recorded from the lake by HOPSON & HOPSON (1982); endemic to lake Turkana; 40 cm SL (HOPSON & HOPSON 1982).
TETRAODONTIFORMES	
Tetraodontidae (1 species)	
Tetraodon lineatus Linnaeus, 1758	*Tetraodon fahaka rudolfianus* Deraniyagala, 1948, described from lake Turkana, is now a junior synonym of *T. lineatus*; recorded by subsequent studies (HAMBLYN 1962; MANN 1964; HOPSON & HOPSON 1982) from Lake Turkana; Nilo-Sudanic in distribution; 43 cm TL (SEEGERS et al. 2003).

particularly to members of the family Mormyridae, most of which are restricted to the Omo River system.

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APPENDIX

A bracketed artificial identification key for the fish species in Ethiopian waters of the Omo-Turkana basin (see Table 4); numbers in parenthesis refer to the lead characters from which the respective couplets follow.

The characters used to develop the key are relatively simple and conspicuous to facilitate in-field identification of the basin's fish species. The key is intended for identification of fish species in Omo-Turkana basin within the limit of Ethiopia and thus its application outside this range might be limited.

1	**a**	8 or more closely spaced finlets along back; scales thick, interlocking and rhomboid; body elongate 2
1	**b**	No dorsal finlets; body scales present or absent, if present cycloid or ctenoid not rhomboid 3
2(1[a])	**a**	8–11 dorsal finlets (often 9); 53–61 (often 57) scales in the lateral line; body rather grayish . . . . . ***Polypterus senegalus*** (Figure 3b)
2	**b**	13–18 (often 17) dorsal finlets; 63–70 (often 67 scales) in the lateral line; body rather dark brownish . . . . . ***Polypterus bichir*** (Figure 3a)
3(1[b])	**a**	Body often covered with various types of overlapping scales, or with small thin spines instead of scales 4
3	**b**	Body naked, without scales or spines 46
4(3[a])	**a**	Jaw teeth present; barbels absent; adipose fin present or absent; caudal fin forked, truncate or round 5
4	**b**	No teeth on jaws; barbels present or absent; no adipose fin; caudal fin forked 28
5(4[a])	**a**	Body scales large and bony; single uninterrupted lateral line; mouth terminal. . . . . ***Heterotis niloticus*** (Figure 3c)
5	**b**	Body scales small and thin or absent; lateral line (when present), single and continuous or two interrupted (incomplete) lines; mouth position variable. 6
6(5[b])	**a**	Small mouth, with restricted gape (opening), terminally located often on elongated snout; thin cycloid scales on the body, none on head; caudal fin deeply forked; no adipose fin 7
6	**b**	Large mouth, with wide gape, variably located on a non-elongated snout; body scales cycloid or ctenoid; caudal fin forked, truncate or round; adipose fin present or absent. 13
7(6[a])	**a**	Snout very elongated resembling a proboscis; dorsal fin base twice as long as anal fin base, its origin nearer to head than to caudal . 8
7	**b**	Snout not proboscis-like; dorsal fin base is as long as, or shorter than, anal fin base, both located posteriorly on body nearer to caudal. 9
8(7[a])	**a**	Proboscis-like snout straight, not curved downward; dorsal fin rays > 75 . . . . . ***Mormyrus caschive*** (Figure 3d)
8	**b**	Proboscis-like snout slightly curved downward; dorsal fin rays < 75. . . . . ***Mormyrus kannume*** (Figure 3e)
9(7[b])	**a**	Dorsal fin base much shorter than anal fin base . . . . . ***Hyperopisus bebe*** (Figure 3g)
9	**b**	Dorsal fin base more or less as long as anal fin base 10
10(9[b])	**a**	Mental swelling on chin well developed . ***Marcusenius cyprinoides***
10	**b**	No mental swelling on chin 11
11(10[b])	**a**	Snout moderately long; head depressed; body elongate, anterior body tinged with dark reddish color; more than 10 teeth on the upper jaw, 14 on lower jaw . . . ***Mormyrops anguilloides*** (Figure 3f)
11	**b**	Snout relatively short; head compressed; body relatively deep; less than 7 teeth in the middle of upper jaw, 10 on lower jaw. 12
12(11[b])	**a**	Dorsal fin originating well in advance of anal fin origin, relatively long with up to 36 rays; dorsal profile tends to be concave . . . . . ***Pollimyrus petherici*** (Figure 3h)
12	**b**	Dorsal fin originating slightly behind anal fin origin, relatively short with up to 22 rays; dorsal profile rather straight . . . . . ***Pollimyrus isidori***
13(6[b])	**a**	Small fleshy adipose fin behind the rayed dorsal fin; caudal fin forked to lunate; dorsal and anal fins with soft rays only 14
13	**b**	No adipose fin; caudal fin truncate or round; dorsal and anal fins with or without spiny rays 23
14(13[a])	**a**	Lateral line located ventrally below midline of flanks; mouth terminal, with robust unicuspid or pluricuspid teeth on both jaws;

body elongate, covered always with cycloid scales. 15

14 **b** Lateral line located in the middle of the flanks; mouth position variable, with fine, flexible teeth on the lip or jaw; body usually deep, covered with cycloid or ctenoid scales 21

15(14[a]) **a** All teeth large and unicuspid, in a single row on each jaw, visible when mouth is closed; adipose eyelid present 16

15 **b** Teeth mainly pluricuspid, in two rows on each jaw, not visible when mouth is closed; inner row of the lower jaw only with two small conical teeth; inner row of premaxilla teeth molariform; adipose eyelid present or absent 17

16(15[a]) **a** Tip of dorsal fin, inner edges of caudal fin, and adipose fin black ***Hydrocynus vittatus*** (Figure 3i)

16 **b** Tip of dorsal fin, inner edges of caudal fin, and adipose fin uniformly grayish. . . . . ***Hydrocynus forkahlii*** (Figure 3j)

17(15[b]) **a** Inner row of premaxilla teeth without cavity; black humeral spot and caudal blotch absent; gill rakers short; less than 35 scales in the lateral line. . . . . ***Micralestes elongatus***

17 **b** Inner row of premaxilla teeth with cavity; black humeral spot and caudal blotch present or absent 18

18(17[b]) **a** Adipose eyelid present; black humeral spot or caudal blotch absent; more than 38 scales in the lateral line. 19

17 **b** Adipose eyelid absent or rudiment; black humeral spot usually and caudal blotch always present; scales in the lateral line fewer than 35 20

19(18[a]) **a** Dorsal fin equidistant between ventral and anal fins or nearer to the latter; gill rakers on the lower half of first gill arch no less than 30; anal fin moderately long, with 25–30 branched rays . . . . . ***Alestes baremoze*** (Figure 3k)

19 **b** Dorsal fin slightly behind the origin of the pelvic fin; gill rakers on the lower half of first gill arch no more than 27; anal fin relatively short, with 22–26 branched rays . . . . . ***Alestes dentex***

20(18[b]) **a** Dorsal fin distantly located behind the pelvic fin; head flattened; teeth in outer row of premaxilla 8–14; sometimes a long orange band running along the body; fins orange-red to pink . . . . . ***Brycinus macrolepidotus***

20 **b** Dorsal fin above or slightly in advance of the pelvic fin; head round; teeth in outer row of premaxilla 8; lateral side silvery; unpaired fins bright red; paired fins colorless or, at most, light orange ***Brycinus nurse*** (Figure 3l)

21(14[b]) **a** Mouth small, terminal, with thin, flexible, unicuspid teeth embedded in lip tissue; body very deep,compressed, covered with cycloid scales . . . . . ***Citharinus citharus intermedius*** (Figure 3m)

21 **b** Mouth small, subinferior or inferior, with fine, bicuspid teeth on the jaws; body less deep, covered with ctenoid scales. 22

22(21[b]) **a** Snout moderately long; teeth small, bicuspid usually in two rows on each jaw; dorsal fin long with more than 22 rays; more than 90 lateral line scales. . . . . ***Distichodus nefasch*** (Figure 3n)

22 **b** Snout short; teeth small, bicuspid usually in one row on each jaw; dorsal fin short with less than 13 rays; lateral line scales fewer than 55 . . . . . ***Nannocharax niloticus***

23(13[b]) **a** Dorsal and anal fins without spiny rays; lateral line absent . . . . . ***Aplocheilichthys jeanneli***

23 **b** Dorsal and anal fins with spiny rays; lateral line present or absent 24

24(23[b]) **a** No pelvic fins; dorsal fin short, located in the posterior body part; body scaleless, head and body covered with small thin spines; lateral line absent; a pair of fused teeth at the front of each jaw; yellow longitudinal bands on the body . . . ***Tetraodon lineatus*** (Figure 4o)

24 **b** All rayed fins present; dorsal fin long, continuous or notched, its origin in the anterior part of the body; body with cycloid or ctenoid scales; lateral line present 25

25(24[b]) **a** Mouth terminal with villiform teeth on jaws; spinous dorsal fin long, deeply notched into anterior spiny and posterior mainly soft rayed portions; body scales ctenoid; single complete lateral line present; caudal fin round . . . . . ***Lates niloticus*** (Figure4n)

24 **b** Mouth terminal with bicuspid teeth on the outer jaws; spinous dorsal fin long and continuous; body scales ctenoid or cycloid; 2 short, incomplete lateral lines; caudal fin truncate; blackish opercular spot 26

26(25[b]) **a** Gill rakers relatively short and thick, 8–12 on the lower half of the first gill arch; body scales often cycloid or feebly denticulate; scales between pectoral and pelvic fins same size as scales on the flanks; a black spot (tilapia mark) at the junction of the spinous and soft dorsal rays . . . . . ***Coptodon zillii***

b Gill rakers relatively thin and long, 14–27 on the lower half of the first gill arch; body scales cycloid; scales between pectoral and pelvic fins smaller than those on the flanks; tilapia mark present or absent. 27

27(26[b]) **a** Scales between pectoral and pelvic fins distinctly smaller than those on the body side; pectoral fins not reaching anal fin; dorsal fin with 29–33 total rays; dark vertical bars or stripes on the body and caudal fin . . . . . ***Oreochromis niloticus*** (Figure4m)

b Scales between pectoral and pelvic fins not much smaller than scales on the flank; pectoral fins reaching anal fin; dorsal fin with 27–31 total rays . . . . . ***Sarotherodon galilaeus***

28(4[b]) **a** Mouth subinferior; 3 pairs of barbels; 7 branched dorsal-fin rays; the anterior and posterior nares (nostrils) well separated; body naked or with minute scales; bar-like spots on flanks usually of similar size . . . . . ***Afronemacheilus kaffa***

b Mouth terminal to inferior; barbels 1–2 pairs when present; spine-like leading rays in dorsal fin in some species; body covered with cycloid scales, head naked. 29

29(28[b]) **a** Branched anal fin rays no more than 7; mouth inferior, subinferior or terminal; barbels present; lateral line in the middle of the caudal peduncle 30

b Branched anal fin rays no less than 9; mouth often terminal or rarely subinferior; barbels absent; lateral line along middle or lower part of the caudal peduncle 43

30(29[a]) **a** Mouth typically inferior, with well developed sucker-like lips, 1or 2 pairs of minute barbels; dorsal fin origin well in advance of the origin of ventral fins 31

b Mouth inferior, subinferior or terminal; lips thin or thick but never sucker-like; 2 pairs of barbels; dorsal fin origin above or slightly behind or in advance of the origin of the ventral fins 37

31(30[a]) **a** Lower lip modified posteriorly into a well developed round mental disc, with free lateral and posterior margins; 2 pairs (nasal and maxillary) of small barbels 32

b Both upper and lower lips well developed into a sucker-like structure, but not forming a mental disc; 1 pair of small maxillary barbels . . 33

32(31[a]) **a** No extrernally visible scales on the chest, belly and post-pelvic regions; 36–38 lateral line scales in the lateral line . . . . . ***Garra dembeensis***

b At least some scattered scales on the chest, belly and post-pelvic regions; 34–35 lateral line scales . . . . . ***Garra quadrimaculata***

33(31[b]) **a** Eye lateral, visible both from below and above; rostral flap attached at sides, its free margin smooth; transverse plicae of papillae present or absent on the inner sides of the lips; dorsal fin with more than 10 branched rays 34

b Eye supero-lateral visible only from above; rostral flap detached at sides, its free margin feebly denticulate; transverse plicae of papillae present on the inner sides of the lips; dorsal fin with 9–10 branched rays 36

34(33[a]) **a** Branched dorsal fin rays more than 14, its upper edge often more or less concave; 41–45 lateral line scales; no transverse plicae of papillae on the inner sides of the lips . . ***Labeo niloticus*** (Figure 3p)

b Branched dorsal fin rays not more than 14, its upper edge convex or slightly straight; at least 36 lateral line scales. 35

35(34[b]) **a** Labial folds rather poorly developed; 40–44 scales in the lateral line; no transverse plicae of papillae on the inner sides of the lips . . . . . ***Labeo horie*** (Figure 3o)

b Labial folds relatively well developed; 36–40 scales in the lateral line; transverse plicae of papillae present on the inner sides of the lips . . . . . ***Labeo coubie*** (Figure 4a)

36(33[b]) **a** Eye relatively large (OD, orbit diameter > 18% HL, head length); transverse groove above the snout present; scales in the lateral line 38–42. . . . . ***Labeo forskalii***

b Eye relatively small (OD < 18% HL); no transverse groove above the snout; scales in the lateral line 35–39 . . . . . ***Labeo cylindricus***

37(30[b]) **a** Radiating or divergent striae in the outer parts of the scales; 7 or 8 branched dorsal fin rays; fewer than 10 gill rakers in the lower limb of the first gill arch; mouth terminal or subinferior; 2 pairs of barbelsin adults 38

b Parallel striae in the outer parts of the scales; 9 or 10 branched dorsal fin rays; up to 20 gill rakers in the lower limb of the first gill arch; mouth inferior or slightly inferior; 2 pairs of barbels 41

38(37[a]) **a** Lateral line incomplete; mouth terminal; dorsal fin with III 8 rays, last unbranched ray not serrated; flanks with up to 5 spots . . . . . ***Enteromius stigmatopygus***

b Lateral line complete 39

39(38[b]) **a** Last unbranched dorsal fin ray serrated on its posterior side;

mouth terminal and oblique. . . . . ***Enteromius paludinosus***

b Last unbranched dorsal fin ray not serrated on its posterior side; mouth subinferior 40

40(39[b]) **a** Barbels well developed; dorsal fin with III 7 rays; barbels relatively well developed, anterior one about 1.3–1.5 times eye diameter, posterior one about 1.75–2 times eye diameter . . . . . ***Enteromius arambourgi***

b Dorsal fin with III 8 (rarely 7) rays; barbels relatively small, anterior one short only reaching to anterior margin of eye, posterior barbel reaching to posterior half of eye . . . . . ***Enteromius perince***

41(37[b]) **a** Lower lip forming large median lobe; upper lip well developed, its lobe curling back over the snout; mouth inferior . . . . . ***Labeobarbus nedgia***

b Lower lip not forming a distinct median lobe or very small lobe; upper lip without lobes; mouth inferior or terminal. 42

42(41[b]) **a** Mouth inferior; body very deep (31–38% SL, standard length); angular dorsal profile; dorsal fin, longer than head, the last unbranched non-serrated ray ossified into a massive spine, and upper fin border concave; 28–37 scales in the lateral line . . . . . ***Labeobarbus bynni***

b Mouth terminal; body rather shallow (19–32% SL); less angular dorsal profile; dorsal fin, shorter than head; 30–36 scales in the lateral line . . . . . ***Labeobarbus intermedius***

43(29[b]) **a** Dorsal fin beginning slightly behind level of anal-fin origin; lateral line low on the caudal peduncle; mouth terminal and oblique . . 44

b Dorsal fin beginning distinctly before level of anal-fin origin; lateral line low or in the midline of caudal peduncle; mouth subinferior or terminal. 45

44(43[a]) **a** 11–15 black vertical blotches on the flanks . . . . . ***Raiamas senegalensis***

b No black vertical blotches on the flanks . . . . . ***Chelaethiops bibie***

45(43[b]) **a** Lateral line along midline of caudal peduncle; mouth subinferior . . . . . ***Leptocypris niloticus***

b Lateral line low on the caudal peduncle; mouth terminal, extending to beyond the anterior margin of eye . . . . . ***Neobola bottegoi***

46(3[b]) **a** 3 pairs of barbels (maxillary and 2 pairs mandibular), adipose fin present. 47

b 4 pairs of barbels (nasal, maxillary and 2 pairs mandibular); adipose fin present or absent. 57

47(46[a]) **a** Adipose fin rayed, followed by bony spines; series of bony scutes along each side of the back and belly; extremely shallow or slender caudal peduncle; caudal fin crescentic. . . . . ***Andersonia leptura***

b Adipose fin fleshy, not followed by bony spines; no bony scutes on the body; caudal peduncle not extremely shallow; caudal fin nearly truncate, emarginated or deeply forked 48

48(47[b]) **a** Rayed dorsal fin absent; caudal fin nearly truncate; spinous rays absent. 49

b Rayed dorsal fin present; caudal fin emarginate or deeply forked; spinous rays in dorsal and pectoral fins 50

49(48[a]) **a** Pectoral fins placed low on the body, obliquely oriented; broad tooth patches on jaws . . . . . ***Malapterurus minjiriya*** (Figure4h)

b Pectoral fins placed more dorsally, near the body mid-depth, vertically oriented; narrow crescent shaped tooth patches on jaws . . . . . ***Malapterurus electicus***

50(48[b]) **a** Caudal fin weakly emarginated, anterior nostrils tube-like and positioned on upper lip 51

b Caudal fin deeply forked, anterior nostrils positioned on snout . . 52

51(50[a]) **a** Relatively long and more pointed snout; maxillary barbels always shorter than the outer mandibular barbel, not extending beyond the posterior border of eye . . . . . ***Auchenoglanis occidentalis*** (Figure4c)

b Relatively short and less pointed snout; maxillary barbels always longer than the outer mandibular barbel, extending beyond the posterior border of eye . . . . . ***Auchenoglanis biscutatus*** (Figure4b)

52(50[b]) **a** Mandibular barbels non-branched; eyes without free border; mouth inferior, surrounded by enlarged circular lip . . . . . ***Chiloglanis niloticus***

b Mandibular barbels branched; eyes with free border; mouth inferior, sucker-like but lips not as enlarged as in *Chiloglanis niloticus* . . . 53

53(52[b]) **a** Dorsal fin spine extends into very long filament, up to twice the length of the spine itself; soft rays not extending into filaments . . . . . ***Synodontis filamentosus*** (Figure 4i)

b Dorsal fin spine not extending into filament; first soft ray extending into a usually short filament 54

54(53[b]) **a** Dorsal fin spine smooth along anterior border except for a few apical or basal serrations; basal marginal membrane on maxillary barbel narrow or absent; the upper lobe of caudal fin not extending into a long filament 55

b Dorsal fin spine with fine serrations along anterior margin; basal marginal membrane on maxillary barbel broad; the upper lobe of caudal fin often extending into a long filament. 56

55(54[a]) **a** No basal marginal membrane on maxillary barbel; dorsal fin spine feebly serrated along posterior margin; body spots absent . . . . . ***Synodontis schall*** (Figure 4j)

b Basal marginal membrane on maxillary barbel distinct but narrow; dorsal fin spine rather strongly serrated along posterior margin; body covered with very small black spots, but none on caudal fin . . . . . ***Synodontis frontosus***

56(54[b]) **a** Dorsal fin spine coarsely serrated along posterior margin . . . . . ***Synodontis sorex***

b Dorsal fin spine finely serrated along posterior margin . . . . . ***Synodontis serratus***

57(46[b]) **a** Caudal fin round; dorsal fin long, with 50 or more rays; anal fin long extending near to the caudal fin 58

b Caudal fin forked; dorsal fin short, with not more than 11 rays; anal fin short, or long extending up to caudal 59

58(57[a]) **a** Fleshy adipose fin absent behind the rayed dorsal fin . . . . . ***Clarias gariepinus*** (Figure 4d)

b Fleshy adipose fin present behind the rayed dorsal fin . . . . . ***Heterobranchus longifilis***

59(57[b]) **a** Anal fin long extending from ventrals to caudal; mouth terminal 60

b Anal fin short, not extending to caudal; mouth subinferior 62

60(59[a]) **a** Fleshy adipose fin present; sloped upper head profile, with gradually ascending nape from occiput to the dorsal fin . . . . . ***Schilbe mystus*** (Figure 4k)

b Adipose fin absent; upper head profile horizontal or sloped 61

61(60[b]) **a** Horizontal upper head profile, with abruptly ascending nape from occiput to dorsal fin . . . . . ***Schilbe uranoscopus*** (Figure 4l)

b Sloped upper head profile, with gradually ascending nape from occiput to dorsal fin . . . . . ***Schilbe intermedius***

62(59[b]) **a** Maxillary barbels short, not extending beyond head; caudal fin lobes not extending into long filaments; dorsal fin with 6 unbranched rays . . . . . ***Chrysichthys turkana*** (Figure 4g)

b Maxillary barbels extremely long, extending beyond head, reaching ventral or anal fins; upper caudal lobe extending into long filament, but the lower lobe may or not 63

63(62[b]) **a** Both upper and lower caudal fin lobes extending into long filament; the first branched dorsal fin ray extending into a short filament; dorsal fin with 9–11 (often 10) branched rays . . . . . ***Bagrus bajad*** (Figure 4e)

b Upper caudal fin lobe extending into long filament but the lower lobe not; the first branched dorsal fin ray not extending into a short filament; dorsal fin with 8–10 (often 9) branched rays . . . . . ***Bagrus docmak*** (Figure 4f)